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PRACTICAL GYNECOLOGY

MONTGOMERY

PRACTICAL GYNECOLOGY

A COMPREHENSIVE TEXT-BOOK
FOR STUDENTS AND PHYSICIANS

BY

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FOURTH EDITION

REVISED AND REARRANGED

WITH FIVE HUNDRED AND EIGHTY-NINE ILLUSTRATIONS, THE GREATER
NUMBER OF WHICH HAVE BEEN DRAWN AND ENGRAVED SPECIALLY
FOR THIS WORK, FOR THE MOST PART FROM ORIGINAL SOURCES

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TO

THE LATE

DR. W. H. WARDER

MY CONSCIENTIOUS INSTRUCTOR AS QUIZ-MASTER AND HOSPITAL
CHIEF, AND MY GENEROUS FRIEND,

THIS BOOK IS RESPECTFULLY DEDICATED.

PREFACE TO FOURTH EDITION.

In the preparation of the fourth edition of this book I have so rearranged it as to secure what experience in teaching has demonstrated to be a more progressive order. It opens with special anatomy, which is followed in order by physiology; etiology; diagnosis; therapeutics, general and special; functional disorders; malformations; traumatisms; inflammations; displacements; ectopic gestation and genital tumors.

While much that has become obsolete is omitted, enough is retained to give the careful student of gynecology an idea of what has been done and of the progress of the science. In the consideration of the special disorders of the various pelvic structures especial effort is made to emphasize the influence of constitutional conditions and to impress the importance of the treatment from the medical side.

Thus the acute and chronic inflammations of the uterus and of the peritoneum are largely rewritten. Vaccine- and serotherapy are carefully considered. Early recognition, and prompt as well as radical treatment of cancer of the uterus are advocated. I take this opportunity to express my appreciation of the assistance of Dr. P. Brooke Bland in rewriting the microscopic diagnosis and the methods of blood-study; of the assistance of Miss Edith Ramsay in the preparation of the manuscript; of the services of Miss S. L. Clark in preparation of new sketches; and to the publishers for their valuable suggestions and uniform courtesy.

E. E. MONTGOMERY.

PREFACE TO FIRST EDITION.

I will offer no apology for presenting an additional text-book upon gynecology.

This work has been under consideration for the last fifteen years, and much of it has been several times rewritten. An effort has been made to make it a comprehensive work upon the subject, giving the experience and methods of the most careful men, while my own experience has been utilized to indicate that which I have found most useful and worthy of acceptance.

Each general subject is considered with reference to its influence upon the entire genital tract, and the work is divided into sections rather than chapters. This course, although a departure from the ordinary text-book arrangement, is that which experience has demonstrated to be most effective in impressing the subject upon the student, and would seem to me preferable to him who uses the book to refresh his knowledge upon any particular subject. The illustrations are arranged solely with the purpose of rendering clear the text and to promote the work of diagnosis and treatment. For their excellence and character I am greatly indebted to the generosity of the publishers and to the skill and patience of their artists, Messrs. Shannon and Von du Lancken. To the kindly oversight of Dr. Robert L. Dickinson is due much of the exactness of the drawings. Acknowledgment is due Miss Eleanor A. Cantner for her ability in the preparation of preliminary sketches and of the index.

Should it be the means of lightening the work of the student, of making more clear the pathway of the busy practitioner, and, most of all, of benefiting suffering women through improved methods of diagnosis and treatment, I shall feel well repaid for the many days and nights of labor which it has cost.

THE AUTHOR.

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PRACTICAL GYNECOLOGY.

EMBRYOLOGY AND ANATOMY OF THE GENITO-URINARY ORGANS OF THE WOMAN.

1. **Development of the Genito-urinary Organs.** For a proper understanding of the conditions in which the genito-urinary organs fail to attain the normal, a knowledge of their origin and development is necessary.

Their normal progress in the embryo may be divided into five stages:

The first period extends to the eighth week. After fecundation, no sexual indication is manifest before the fifth week. A primordial kidney, Wolffian body, duct of Müller and Wolffian duct, from which the genital organs originate, develop on each side of the median line. At the site of the future vulva, a cloaca is situated, into which the urachus and intestine open. On the external surface of each Wolffian body a structure develops known as the genital gland. Subsequently this forms either the testicle or ovary. Simultaneously the cloaca becomes divided by a projection—the genital eminence or tubercle—and the latter is marked by the genital furrow or groove. The appearance of these structures at the eighth week affords no clue as to the probable sex.

The second period lasts from the eighth to the twelfth week. The Müllerian ducts coalesce and for the lower two-thirds of their extent the septum disappears. The point of division between the tube and the uterus is indicated by the insertion of the round ligament. The cloaca undergoes further change which, by the development of the perineum, is divided into two portions; the urogenital sinus and the anus.

The third period, the twelfth to the twentieth week, witnesses the fusion of the uterine horns; the appearance of the arbor vitæ in the uterine cavity; formation of the cervix; enlargement of the perineum; and development of the vagina which opens into the urogenital sinus and forms the vaginal vestibule in which the hymen appears. The genital tubercle, which heretofore has been large, is reduced to the proportions of the clitoris, and the edges of the genital fissure become the nymphæ.

The fourth period extends from the twentieth week to the end of fetal life. During this period the fundus of the uterus increases in size; the mucous membranes of the vagina and cervix become folded, and the labia majora grow fuller and more rounded.

The fifth period comprises from the time of birth until puberty. The uterus increases in size and thickness; the uterine mucous membrane, which prior to the sixth year is folded like that of the cervix, becomes smooth. The vagina is elongated, and the vulva is larger and more rounded.

2. Division of the Genitalia. The special generative organs of the woman occupy the pelvis in close association with the bladder, urethra, rectum, and anus. The female genitalia comprise two classes of organs, the external and the internal. The former with the vagina form the organ of copulation, the latter the reproductive organs proper.

The external genital organs as enumerated from before backward comprise the mons veneris, labia majora, labia minora, clitoris, vestibule (perforated by the meatus urethræ externus), orifice of the vagina (surrounded in the virgin by the hymen), fourchet, fossa navicularis, and perineum—the latter situated between the vulva and anus. The external genitalia are also named vulva, pudendum, or cunnus; and the cleft between the labia majora, the rima pudendum.

2a. *The mons veneris* is a cushion of fat situated over the pubes. It is covered with thick skin abundantly supplied with hair which protects the vulva from the perspiration of the body. When the nude woman is erect, the mons veneris is the portion of the genitalia visible.

2b. *The labia majora* are skin folds which, in front, merge into the mons veneris. Posteriorly they thin off and terminate about one and one-half inches in front of the anus. Externally they are covered with short, crisp hair which is continuous with that of the mons veneris. They are profusely supplied with sebaceous and sudoriferous glands. Their surfaces present a smooth, moist surface which resembles mucous membrane. The apposition of the labia majora, slightly separated by the labia minora and clitoris, forms a cleft of the vulva, the rima pudendum. Each labium contains a sac-like structure called the dartoid. This is analogous to a similar structure in the male scrotum. The round

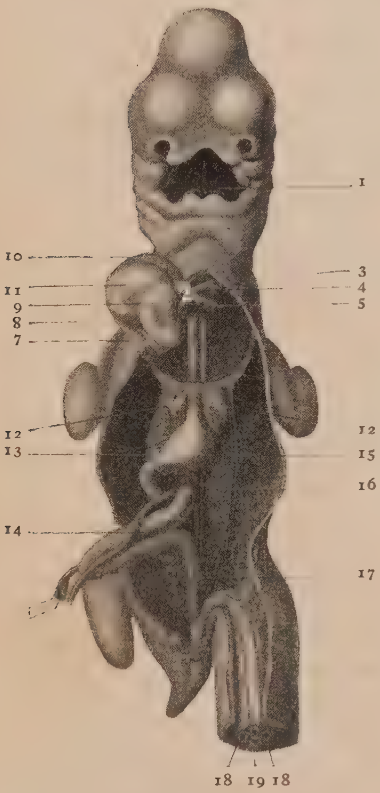


FIG. 1.—Human Embryo at End of Thirty-five Days. (*Coste.*)

1. Tongue. 2. Aortic bulb. 3. First permanent aortic arch. 4. Second aortic arch. 5. Third aortic arch, or ductus Botalli. 6. The two filaments to the right and left of this figure are the pulmonary arteries. 7. The trunk of the superior vena cava and the right azygos vein. 8. The common venous sinus of the heart. 9. Left auricle of the heart. 10. Right ventricle. 11. Left ventricle. 12. Lungs. 13. Stomach. 14. Left omphalomesenteric vein. 15. Wolffian body. 16. Right omphalomesenteric vein. 17. Intestine. 18, 18. Umbilical arteries. 19. Umbilical vein.

ligament, and, in the fetus, an open canal called the canal of Nuck, terminates in this dartoid sac. Occasionally the latter remains open in the woman, permitting the formation of a hydrocele. In fat subjects these folds contain a large quantity of adipose cellular tissue.

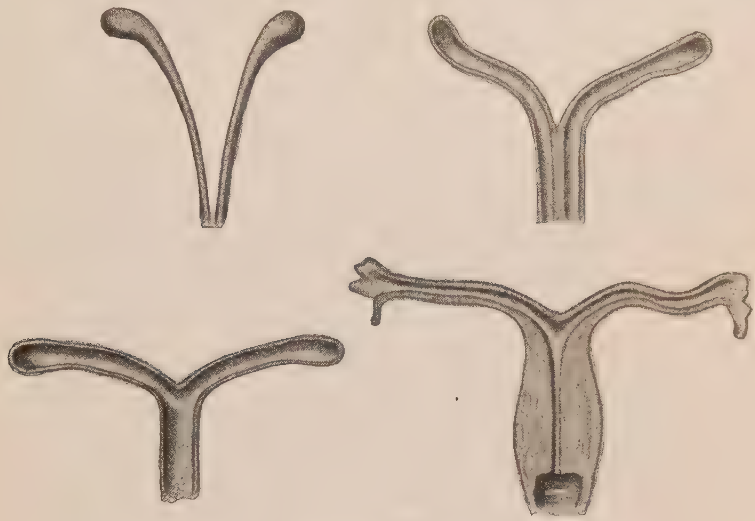
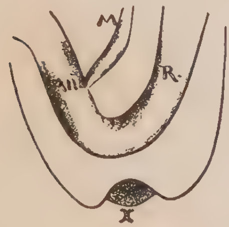
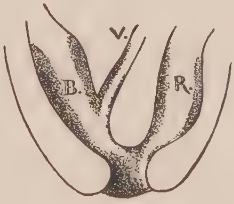
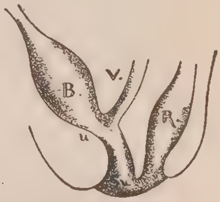


FIG. 2.—Coalescence of Müller's Duct.

2c. *The labia minora* are situated between the labia majora slightly projecting beyond their level, and more prominent anteriorly. Upon wide separation they are seen to be continuous with the fourchet and form the posterior commissure. Anteriorly they bifurcate and form two folds: the anterior one passes in front of the clitoris to form its prepuce or hood, the posterior one passing behind the glans clitoris and forming the frenulum. The labia minora (also called the nymphæ) have a slightly roughened surface with free, convex borders, sometimes notched. Frequently







Progress of Development of the Genitalia.

FIG. 3.—All. Allantois. R. Rectum. M. Müller's duct. X. Indentation of the skin which forms the anus. (*Schröder.*)

FIG. 4.—Cl. Cloaca. B. Bladder. R. Rectum. V. Vagina. (*Schröder.*)

FIG. 5.—Su. Urogenital sinus. R. Rectum, separated from the former by the perineum. B. Bladder. V. Vagina. u. Urethra. (*Schröder.*)

small openings or perforations are seen. The size of the nymphæ varies greatly according to the race and age of the subject. They project considerably beyond the vulva in the young child, but, owing to the increase in size of the labia majora as puberty approaches, they are rendered less apparent. In the Bushwomen the labia minora frequently become so long that they reach to the knees, and are then spoken of as the Hottentot apron. The skin is covered with stratified pavement epithelium, similar to that of the true epidermis. They are plentifully supplied with sebaceous glands, especially at the base of the folds where they form a crowded layer upon the inner surface. In the brunette the pigment deposit frequently is so great as to make them noticeably dark. The skin folds contain a small amount of connective tissue. During the act of coition the labia minora hold the glans clitoris against the male organ.

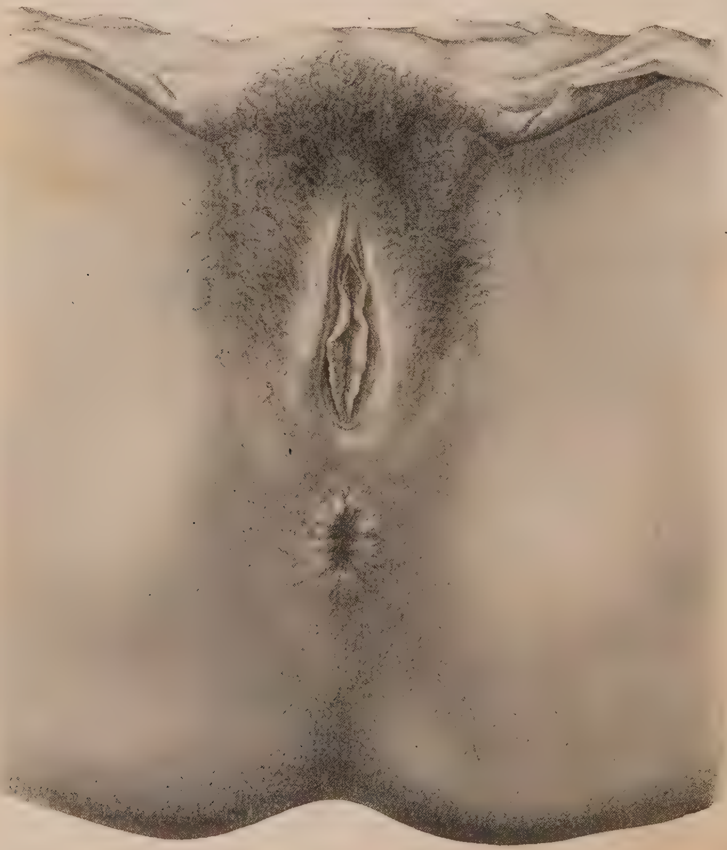


FIG. 6.—Virgin Vulva; Labia not Separated. (*From Deaver.*)

2d. *The clitoris*, as in the male is an erectile organ, formed by a crus clitoris or corpus cavernosum arising on either side from the posterior surface of the ischio pubic rami, which unite to form one body in front of the symphysis. The organ is secured to the symphysis by a suspensory ligament, and its circulation is influenced by the ischi-cavernosus muscle, in which respect it resembles the penis. The corpora cavernosa are enveloped by a fibrous investment and separated by a median septum of cavernous tissue composed of fine trabeculæ, in which the muscular elements predominate. The free extremity of the clitoris is situated at the anterior part of the vulva, about one-half inch behind the anterior extremities of the labia majora. The organ is surmounted by a median tubercle known as the glans clitoridis. The glans is more or less covered by the prepuce formed by the anterior folds of the labia minora or nymphæ. The glans is imperforate and generally is but slightly developed. When the clitoris is large, the other parts of the vulva generally are found small and ill developed.

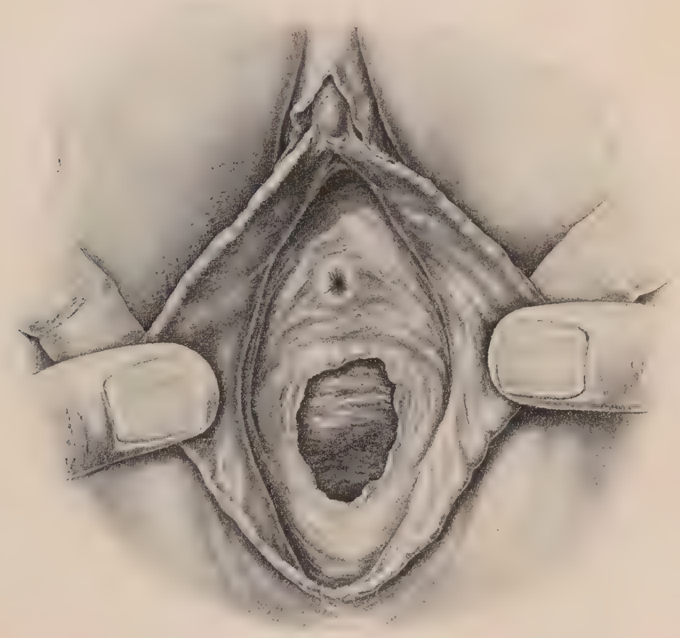


FIG. 7.—Virgin Vulva; Labia Separated, Showing the Hymen Unruptured. (*From Deaver.*)

2e. *The vestibule* is described by some anatomists as the entire space between the labia minora, which, prior to the rupture of the hymen, includes the external surface of the latter. But, as this portion disappears largely after successful coition, and completely after parturition, it seems better to confine the term to the portion ordinarily so denominated. This has for its boundaries the labia minora on each side, and the anterior border of the vagina posteriorly. The triangular space thus formed has the glans clitoridis for its apex; and, at its centre, near the posterior border, is a rounded pouting orifice—the meatus urethræ externus. Two clusters of large mucous follicles also have the openings of their ducts in this situation. One of the group lies immediately behind the clitoris, and when its ducts become occluded, a cyst is formed. The other is situated near the meatus. Mucus is secreted very freely by these follicles under any persistent local irritation. In the virgin, a grooved ridge is seen, which, according to Pozzi, represents the corpus spongiosum of the male and is known as the vestibular band. Behind the clitoris in the posterior part of the vestibule and about one inch in front of the fourchet is situated the orifice of the meatus urethræ. Ordinarily it presents a longitudinal or starred slit, the borders of which are slightly notched and projecting. Occasionally its mucous membrane bulges, forming a ring-like margin.

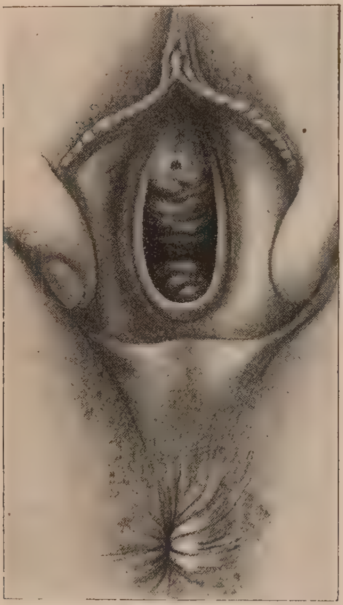


Fig. 8.—Hymen Crescens.

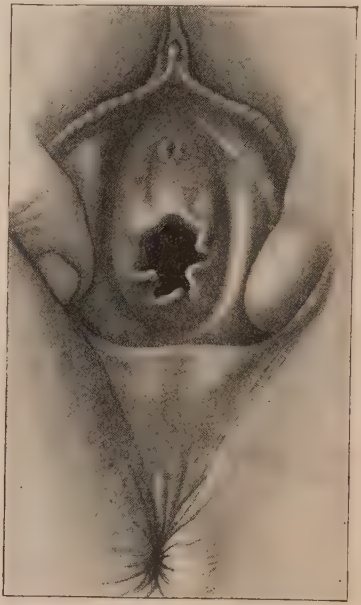


Fig. 9.—Hymen Annularis.

Within the elevated margins of the meatus, and slightly posterior to its center, is found a minute opening on each side. These are the orifices of Skene's ducts, which are parallel to the urethra and about 2 cm. in length. Usually they are not detected easily in healthy subjects, but following gonorrhea or leukorrhea are recognized readily. Under such circumstances, they are sometimes so large that a catheter may enter one of the canals instead of the orifice of the urethra. A patient recently came under my observation in whom the external openings were occluded and projected on either side of the urethra partially obstructing it.

2f. *The hymen* is a thin membrane acting as a sort of diaphragm between the internal genital parts, the external genital parts, and the orifice of the urethra. It is revealed by separation of the labia minora (Fig. 7).

Its exterior surface resembles the structure of the latter, while the interior frequently presents the rugæ of the vagina. When the labia are not forcibly separated, the hymen appears as a vertical slit with its lateral edges in contact. With the labia held apart however, the opening is usually crescentic with its concave margin anterior. (Fig. 8.) Sometimes it is annular with a central opening. (Fig. 9.) The hymen may present a variety of forms and openings, such as the labial form, in which the lateral folds may be mistaken for the labia minora; the linguiformis, which presents a tongue-shaped projection posteriorly, and the falciform, which has a somewhat long and wide orifice. The free edge of the hymen may be smooth, denticulated, or serrated. (Fig. 10.) Its structures may be thick and fleshy, and present irregular folds resembling fimbriæ. The infundibular form (Fig. 11) presents a funnel-shaped appearance with the margins looking downward and backward. There may be two openings, the septus or biseptus (Fig. 12), or a number of openings, as the cribriform. (Fig. 13.) The hymen guards the entrance of the vagina; usually ruptures during the first coition, and occasionally its tear is followed by profuse and often dangerous bleeding. (Fig. 14.) The membrane is usually thin and easily torn, but occasionally it is so firm that it withstands the most strenuous efforts of coition, and, therefore will require incision before the sexual act can be accomplished. The greater portion of the hymen is destroyed during the process of parturition, the remainder shrinking together to form small masses at the vaginal outlet. These masses are known as the carunculæ myrtiformes. The number, form, and situation of these caruncles vary extremely. Generally there are three.

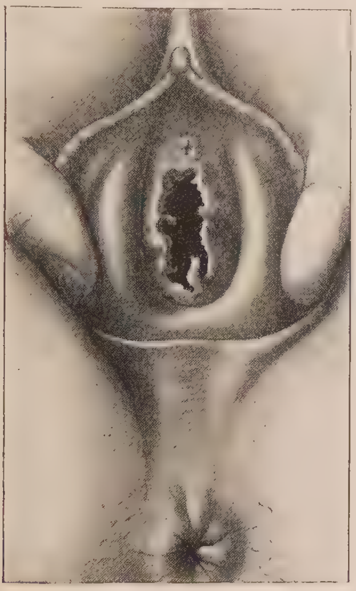


FIG. 10.—Hymen Serratus.

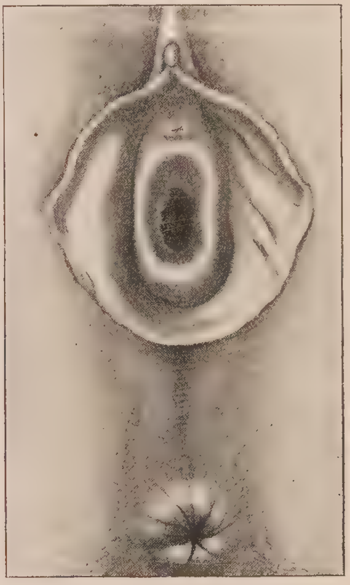


FIG. 11.—Hymen Infundibularis.

One is situated at the posterior part, the others at the sides of the entrance to the vagina. Both surfaces of the hymen are covered with pavement epithelium.

2g. *The fourchet* is a continuation backward of the labia minora in the form of a thin fold, and is rendered prominent by the separation of the vulva. Between this fold and the hymen is a boat-shaped depression called the fossa navicularis. Between the fourchet and the anal opening is an intervening space covered with integument, some 4 cm. in length. This is called the perineum.

3. **The Muscles of the perineum** are exposed by the removal of the skin, the superficial fascia, and a layer of the deep fascia. The muscles thus mapped out are: The *erector clitoridis;* the *bulbocavernosus* and the *transversus perinei,* paired muscles; and the *sphincter ani* and *levator ani,* which are single. The erector clitoridis arises from the anterior margin of the rami of the pubes and ischium and is inserted by two tendonous expansions, one above the junction of the crura into the body of the clitoris, and the other below and in front. The bulbocavernosi muscles arise from the tendinous raphe and anterior aponeurosis of the perineum, and are separated by the vagina, around which they course, to be inserted by a thin slit into the crus of each side in front of the erector clitoridis. The outer fibers of the muscle wind inward beneath the erector muscles to reach the upper part of the bulb near its isthmus. A portion of the mediam fibers are apparently derived from the *sphincter* and pass upward to the clitoris, over the pubes, and are lost in the superficial fascia.

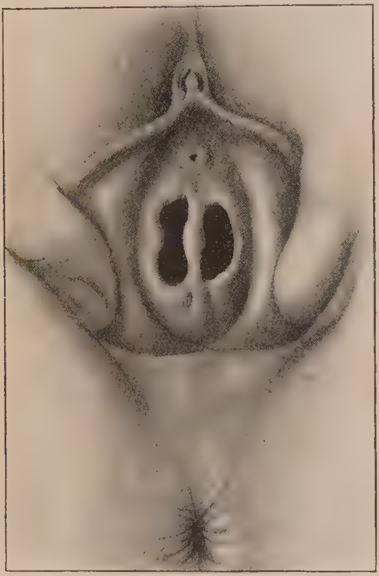


FIG. 12.—Hymen Biseptus.

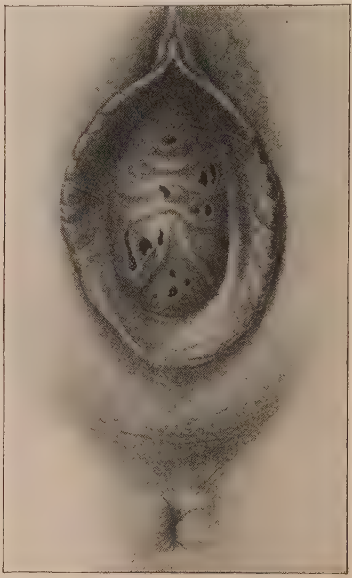


FIG. 13.—Hymen Cribriformis.

Other fibers form a delicate muscular arch in front of the body of the clitoris. The action of the muscles is to compress the bulb of the vagina and to some degree act as a sphincter of the vagina though Savage assigns the latter function to a portion of the *levator ani*. The relation of a portion of the fibers to the *sphincter ani* produces a *figure-of-8 action upon the two orifices*, which it is important to remember in operations upon the sphincter. The *transversus perinei* muscles arise one on each side from the tuberosity of the ischium, and are attached to the anterior aponeurosis of the perineal septum, the perineal body, and the skin of the perineum in front of the anus. The *sphincter ani* arises from the tip of the coccyx and is attached in front to the tendinous raphe of the perineum, where it meets the fibers of the *bulbocavernosi*. Its fibers, closely attached to the skin, decussate in front of the anus, while some fibers appear to pass completely around it. The muscle is pierced by radiating fibers from the longitudinal muscular coat of the rectum, and is in close relation with the *levator ani* and *internal sphincter*. This muscle forms the external sphincter and is voluntary in its action. The *levator ani* is the principal muscle of the pelvic floor. It arises from the back of the body and horizontal ramus of the pubes, the pelvic fascia (white line), and the spine of the ischium. From its origin the muscle sweeps downward and inward and is attached in the middle line from before backward as follows: To the vagina, to the rectum, to its fellow of the opposite side, and, finally, to the tip of the coccyx. The pubic fibers blend with the posterior half of the upper border of the *sphincter vaginæ*. This muscle is more readily exposed from above.

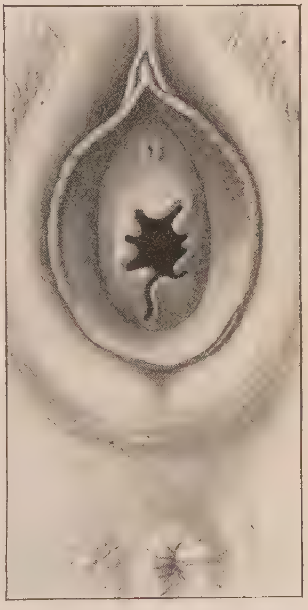


FIG. 14.—Laceration of the Hymen.

The vulvovaginal gland and the bulb of the vestibule are exposed in the dissection already described. The former is a racemose gland, situated on either side of the vagina and posterior to its orifice. It is analogous to Cowper's gland in the male. It is also known as the vulvar gland of Bartholin, or, according to Huguier, the vulvovaginal gland. It is about the size of an almond, but varies in different individuals even upon the two sides. Occasionally glandular nodules are seen, which seem to be detached from the gland and scattered in the surrounding muscle. Within, the gland is in close relation with the vagina, to which it is adherent by tense cellular tissue, while externally it lies beneath the bublbocavernosus muscle. Its excretory duct, about 1 cm. long, is directed from below upward and from without inward and opens in the angle between the hymen and the wall of the vulva. When the hymen has disappeared, its orifice is found in the corresponding angle between the carunculæ myrtiformes and the wall of the vulva. It is usually difficult to detect, but sometimes presents an orifice which will admit a probe. This gland furnishes the secretion which is manifest under the influence of sexual excitement or during coition. *The bulb of the vestibule* is a venous mass which is situated along each side of the vagina and the vestibule. It is related within to the vagina, vestibule, and urethra, and is covered externally by the bulbocavernosus muscle. The bulbs unite beneath the clitoris by a venous connection, the pars intermedia. Kobelt says the injected bulb is nearly 4cm. long, 1cm. wide, and from 9/10 to 1/10 cm. thick. Its external surface is convex; its internal surface concave. The bulb is a part of the erectile tissue of the female genital organs analogous to the corpus spongiosum in the male.

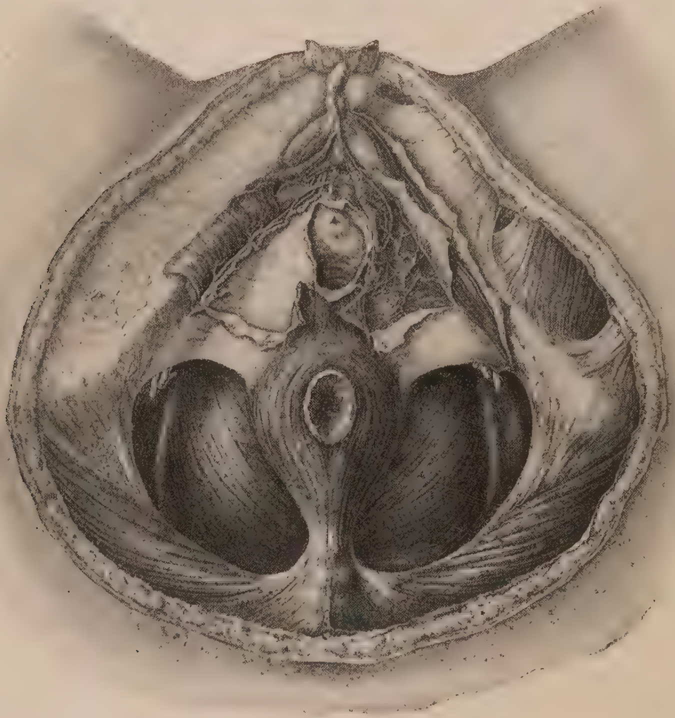


FIG. 15.—Muscles of the Female Perineum. (*Deaver.*)

4. **The perineal fascia** or the fascia of the pelvic floor consists of the following:

a. The superficial fascia.
b. A deep layer of the superficial fascia.
c. The triangular ligament, composed of two layers.

a. The superficial fascia is a continuation of the general fascia of the body. It consists of two layers. The outer more or less loaded with fat, is continuous with the same layer over the buttocks, thighs, and abdomen.

The inner, the peritoneal septum, a more resisting membranous investment descends from the abdomen, narrowed to the width of the pubes, but spreading out so as to envelop the anterior perineal triangle at its base. The abdominal portion of the fascia is firmly adherent to Poupart's ligament; the perineal portion to the outer margin of the ischiopubic rami and the inferior margins of the septum; while the pubic portion is attached along a curved line of the bone, which indicates the origin of muscles of the anterior part of the thigh.

b. A tubular prolongation known as the pudendal sac, extends backward from the margin of the external inguinal ring on each side of the vagina, nearly to the posterior vulvar commissure. With its fellow of the opposite side, when enveloped with their cutaneous coverings, the two sacs form the labia majora. The pudendal sac contains more or less fatty tissue, and the terminal fibers of the round ligament of the uterus are also lost in it. The sac may be the seat of hydrocele from a patulous canal of Nuck, or a hernia may develop by a descent of a section of gut or omentum through this canal. The injection of air into the sac gives a similar appearance to that induced by hernia. The fascia passes around the transverse perineal muscles to form the anterior layer of the triangular ligament. This union forms the ischioperineal ligament—a very firm aponeurotic band attached to the outer ends of the rami of the ischii in front of their tuberosities.

c. The *deep fascia,* or *triangular ligament,* has two layers: an anterior, or superficial; and a posterior, or deep. The superficial is attached to the rami of the pubes and ischium, and to the so-called transverse ligament of the pelvis, which lies immediately behind the subpubic ligament, from which it is separated by an opening for the dorsal vein of the clitoris.

This superficial layer is united posteriorly with the superficial, as well as with the deep layer of the pelvic fascia. The deep layer is likewise attached to the rami of the pubes and ischium, and joins the obturator fascia covering the lower portion of the anterior surface of the levator ani muscle. In front it is continuous with the vesicorectal fascia; behind, with the dense anal fascia which covers the under surface of the levator ani muscle.

The junction of the three layers of fascia forms the ischioperineal ligament, which marks the boundary-line between the urogenital and the anal regions.

The upper surface of the levator ani muscle is covered by a fascia called the pelvic, which is a continuation of the iliac. The pelvic fascia is attached to the iliac portion of the iliopectineal line and to an oblique line upon the posterior surface of the pubic bone, from above and within the obturator foramen, to just below the symphysis. It covers the inner surfaces of the ilium and ischium about halfway down the pelvic wall, until it reaches the so-called tendinous arch, which extends from the spine of the ischium to the pubic bone and below the obturator canal. This portion covers the obturator muscle, and is known as the obturator fascia. A thinner prolongation extends backward, and is known as the pyriform fascia.

The pelvic fascia splits into two layers at the tendinous arch: an upper, called the vesicorectal fascia, which extends over the levator ani muscle, and a lower layer, which follows the obturator internus muscle to the inner edge of the ischiopubic branches, and retains the name of obturator fascia. Below the insertion of the levator ani muscle is given off an investment, which is called the anal fascia. In conjunction with the portion of obturator fascia below the tendinous arch it serves as a lining for the ischiorectal fossa.

The vesicorectal fascia, from its insertion upon the pelvic wall, passes inward and downward and covers the upper surface of the levator ani to the base of the bladder, the vagina, and the rectum. In front, near the middle line, a thicker part of this fascia forms the anterior true ligaments of the bladder, or pubovesical ligaments.

A *ligament of the rectum* arises from the ischial spine and is attached to the side of the rectum. It presents a double layer of fascia with the intervening loose connective tissue, and permits a sliding movement of one part over another.

A study of the relations of the pelvic structures to the layers of the fascia results in the following, according to Hart and Barbour:

Between the skin and superficial fascia:	Superficial hemorrhoidal vessels and nerves.
	Superficial perineal artery and nerve.
Between the deep layer of the superficial fascia and the anterior layer of the triangular ligament:	Transversus perinei.
	Bulbocavernosus.
	Erector clitoridis.
	Transverse perineal blood-vessels and nerves.
	Venus plexuses.
	Bulbs of the vagina.
	Pudendal sacs.
	Dorsal artery and vein of clitoris.
Between the layers of the triangular ligament:	Compressor urethræ.
	Vagina, in part.
	Urethra, in part.
	Pudic vessels and nerves.

5. **Pelvic Diaphragm.** The structures already described as the soft parts, consisting of the pelvic fascia and the muscular structures, constitute the pelvic diaphragm, of which the most important structure is the levator ani. (Fig. 16.)

The origin and insertion of this muscle have been given. It is generally described as two muscles, the levator ani and the coccygeus, but as there is practically no separation, this seems an unnecessary distinction. Savage divides it into three, the pubococcygeus, the obturator coccygeus, and the ischiococcygeus, but this division seems inappropriate when we recognize the fact that none of the muscular fibers arising from the pubes reach the coccyx. The anterior portion of the muscle is covered by the muscles and structures of the external genitalia. The posterior portion is enveloped with the fascia and covered with the following additional layers: the skin; the adipose tissue filling up the ischiorectal fossa, and known as the ischiorectal fat. The boundaries of this irregular triangular space are the levator ani, covered by the anal fascia on the inner side, and the obturator internus muscle, covered by the obturator fascia on the outer side. The lower surface is bounded by the anterior edge of the gluteus maximus muscle and the greater sacrosciatic ligament behind, the transversus perinæi muscle in front, and the sphincter ani upon the inner side. The apex of the triangle is at the spine of the ischium. Behind, the two fossa communicate by the loose adipose tissue back of the rectum, and also by the pelvic fascia. In front, the fossa is limited by the line of junction of the superficial and the deep fasciæ.

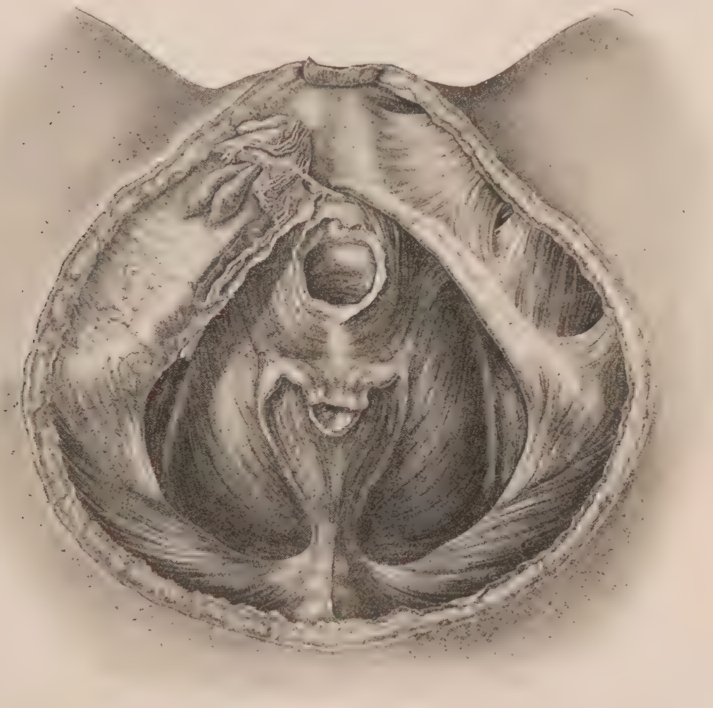


FIG. 16.—The Under Surface of the Levator Ani Muscle. (*Deaver.*)

The posterior fibers of the levator ani pass behind the rectum and are continuous with those of the opposite side. Other fibers are attached to the tip and side of the coccyx.

The action of the pelvic diaphragm is to strengthen the pelvic floor, and, in association with its two enveloping layers of fascia it forms a strong support for the uterus and bladder. Observation of the movements of the floor, with the employment of Sims' speculum, reveals a rhythmic movement synchronous with respiration. The anterior pelvic segment goes downward and backward during inspiration and upward and forward with expiration. The muscle serves to raise up the rectum during defecation and draws the anus toward the symphysis. The fibers between the rectum and vagina influence the size of the vaginal orifice.

6. Perforations (Fig. 17). The pelvic floor is perforated by three slit-like openings, two of which, the vagina and urethra, have axes parallel with the conjugate diameter of the brim. The rectum for a part of its course is similar, but turns backward at the lower part, where it is separated from the vagina by the perineal body. The axis of the anus is at right angles with the plane of the brim. Transverse section of the pelvis through the middle and lower third of the vagina shows it folded in the shape of a letter **H,** with a short lateral and a long transverse bar. The urethra presents a transverse slit, and the rectum an anteroposterior fold.

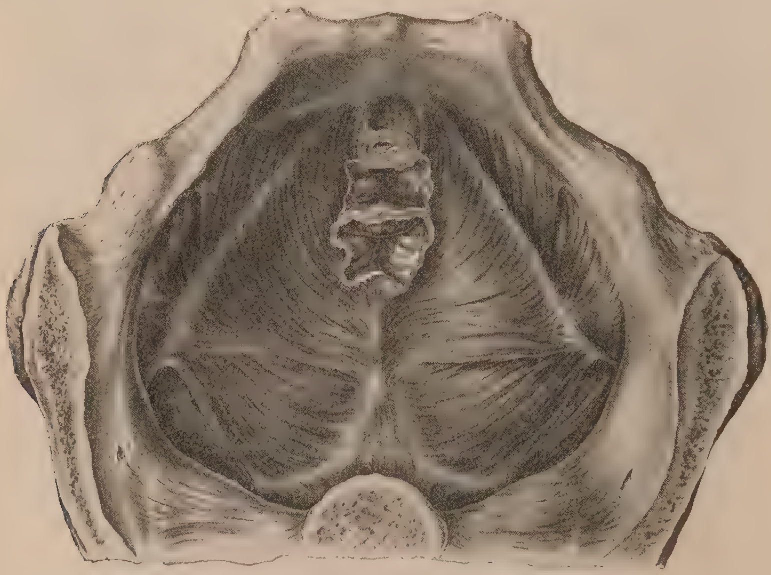


Fig. 17.—The Upper Surface of The Levator Ani Muscle. (*Deaver.*)

7. Internal Genitalia. The internal genitalia are: The vagina, the uterus, the Fallopian tubes, the ovaries, and the parovarium.

The vagina is a musculomembranous canal, lying between the bladder and rectum, and extending from the vulva to the uterus. It is fixed below by its attachments to the pelvic floor, and above surrounds the cervix, with which it is continuous. The direction of the vagina varies with the position and the condition of the adjoining organs—the bladder and the rectum. In the erect position it forms an angle of about 60 degress with the horizon, and is parallel with the conjugate diameter of the brim of the pelvis. (Fig. 18.) Its walls are irregularly triangular, with the widest point at the upper part, where the uterus enters, which in the nullipara measures 3 or 4 cm.; in multiparæ, 6 or 7 cm. The anterior wall is the shorter, 5 cm. long, while the posterior is 7.5 cm. In the normal condition and with the bladder empty, the cervix enters the vagina at a right angle. This angle is rendered more obtuse by distention of the bladder or by an accumulation of feces within the rectum. The vagina is attached to the cervix about 1.5 cm. from the external os, and forms with the cervix a sulcus front and back. The former is known as the anterior, and the latter as the posterior, vaginal fornix. The anterior and posterior vaginal walls lie in contact, and, upon mesial section, present a slit with a slightly convex line directed anteriorly. Transverse section is represented by an **H**-shaped slit, the lateral arms of which are convex upon their inner aspect, with the horizontal limb being slightly anterior.

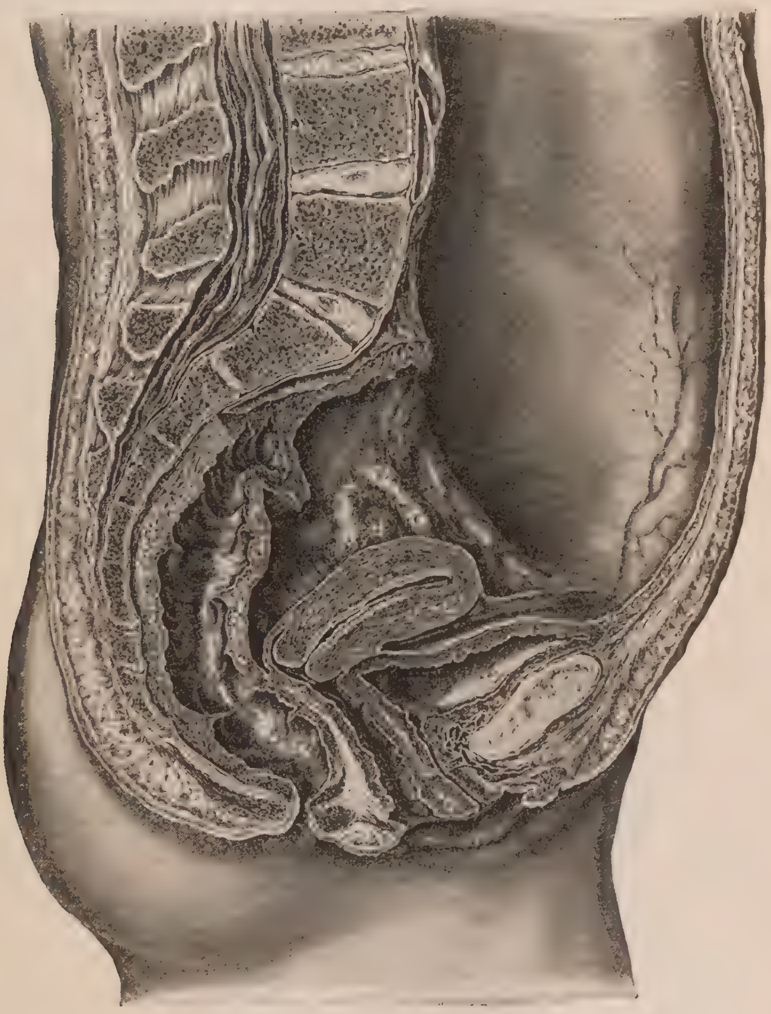


Fig. 18.—A Mesial Section; the Body Erect. (*Deaver*).

The vagina in multiparæ is capable of wide distention and varies in shape. The anterior vaginal wall is united with the posterior surface of the bladder by loose connective tissue which permits its dissection, though separation rarely occurs. The urethra is more intimately associated with this wall. However, it presents no difficulty in dissection.

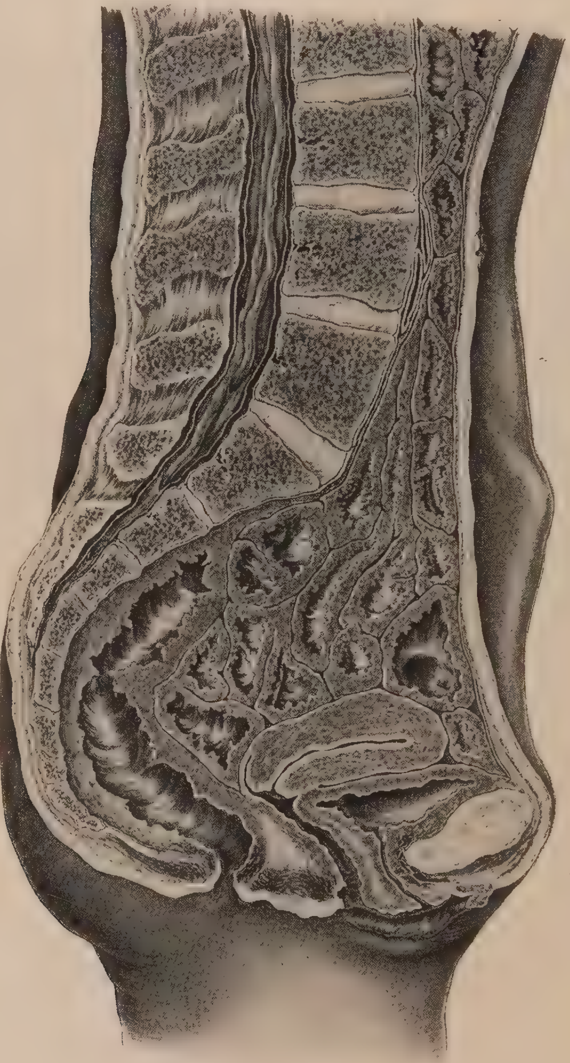


FIG. 19.—A Mesial Section; the Body Recumbent.

The mucous membrane of the anterior wall is thrown into numerous folds or projections, called the rugæ, which are more marked toward the vulva and decreases in size as the upper end of the canal is approached. There are also temporary foldings, which disappear as the vagina is distended. The rugæ consist of a series of transverse ridges, which extend obliquely upward and outward from the longitudinal stem, known as the anterior column.

The transverse projections are composed of secondary ridges, covered with papillæ. The anterior column generally begins behind the meatus, and disappears in the upper third of the vagina; occasionally, its lower portion is divided into two parts by a longitudinal groove, the opposite halves of which subsequently unite. The rugæ are especially marked in young children and virgins, and largely disappear in the multipara. The posterior wall also presents a column with transverse rugæ, but less marked than upon the anterior.

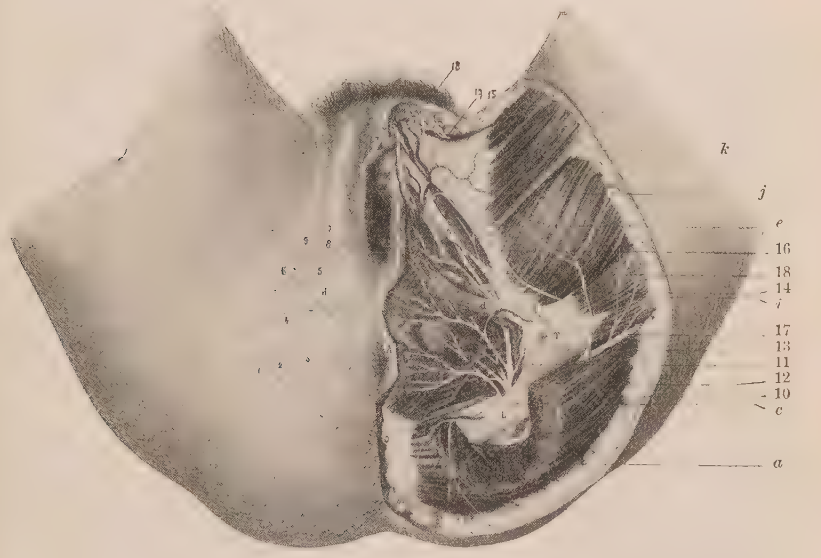


FIG. 20.—Arteries and Nerves of the Female Perineum. (*Savage.*)

1. Internal pudic. 2, 3. Inferior hemorrhoidal. 4. Transverse perineal. 5. Superficial perineal or vulvar. 7. Profunda branch to the clitoris. 8. Artery of the bulb. 9. Dorsal artery to the clitoris. 10. Inferior hemorrhoidal nerve to sphincter and lower rectum. 11. Posterior superficial. 12. Posterior muscular. 13. Trunk of the nerve 14. Anterior superficial branches to the vulva. 15. Anastomotic. 16. Pudendal branch of (17) the smaller sciatic. 18, 18. Continuation of pudic ending in nervous sheath for the clitoris. 19. Outer terminal branch of the ilio-inguinal nerve. A. Anus. M. Urinary meatus. C. Clitoris. L. Greater sacrosciatic ligament. V. Vagina. O. Coccyx. a. Gluteus maximus. b. Superficial sphincter. *c.* Anterior edge of ischiococcygeus. d. Superficial transverse muscle. *e.* Bulbocavernosus muscle. *f.* Slip of anterior aponeurosis of perineal septum. *h.* Upper portion of erector clitoridis muscle. j. Adductor magnus. *k.* Gracilis muscle. T. Nerve-fibrils to integument.

The upper part of the vagina presents, when distended, a dome-like appearance, in which the posterior fornix is twice the depth of the anterior, owing to the higher attachment upon the cervix. The lateral fornices have no especial depth, and only connect the anterior and posterior. As the patient advances in years the vaginal walls atrophy and the rugæ gradually disappear.

The wall of the vagina consists of three layers: an external connective-tissue layer; a middle, of unstriped muscular fiber; and an inner, of mucous membrane. The exterior layer binds the uterus to the surrounding structures and supports the plexus of vessels and lymphatics. The muscle structure consists of longitudinal and circular fibers, intricately interlaced.

Luschka describes a bundle of striated muscle-fibres, which he calls the sphincter vaginæ, surrounding the lower end of the vagina as well as the urethral orifice. The mucous membrane, which extends from the free edge of the hymen to the cervix, over which it is reflected to the external os, varies in thickness from 1 to 1 1/2 mm. It is of a rosy-red color, but may vary from a light pink to a dark-purple or slate color. The latter color is especially characteristic of pregnancy. The mucous membrane is closely attached to the subjacent muscular layer, and is thrown into the already mentioned rugæ. The surface is covered with numerous papillæ, which are greatly increased in size by pregnancy.

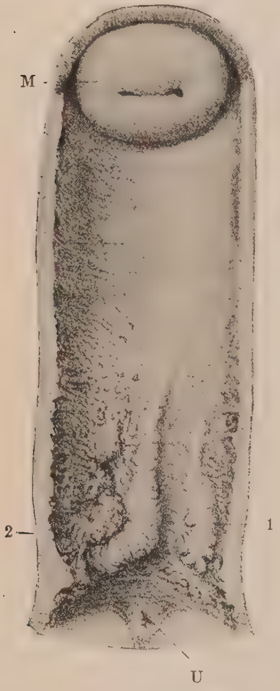


FIG. 21.—Anterior Wall of Vagina, Showing Columnæ Rugarum.
(*Byford, after Savage.*)
1, 2. Anterior columns of the vagina. U. Urethral orifice. M. Cervix.

The mucous surfaces are covered with an acid mucus, which is also markedly increased during pregnancy.

The thickness of the vaginal wall is greater below, where it is about 1 cm., while at the upper part it is not over 5 mm. The difference in thickness is due to the variation in the muscular wall.

A microscopic section of the vaginal wall presents an external layer of fibrous tissue, enveloping large veins, which belong to the vaginal venous plexus. These are surrounded by bundles of smooth muscle-fibers suggestive of erectile structure. Accompanying the veins are large lymphatics, some of which are distended to form sinuses. A middle or muscular layer is also present, in which the outer fibers seem divided transversely, the inner ones being longitudinal.

The mucous membrane consists of a firm basement membrane in which are numerous elastic fibers. It is covered by several layers of stratified pavement epithelium. (Fig. 22.) In addition to the large folds into which the mucosa is thrown, it forms secondary elevations, or papillæ, in each of which is a capillary loop. These loops are single near the fornix, but present a more complicated network near the introitus.

The rugæ consist of large venous plexuses surrounded by bundles of muscle-fibers, as in cavernous tissue.

The lymphatics are abundantly supplied to the mucosa. Lauenstein has described lymph-follicles similar to those in the intestine.

The existence of mucous follicles or glands in the vagina is denied; the mucus is believed to be an exudation from the vaginal surface.

The nerves ramify throughout the walls, communicate with one another and with the ganglia, and terminate in endbulbs beneath the epithelium.

The uterus, or womb, is a hollow, thick-walled, muscular organ, of a truncated shape, which occupies the upper part of the cavity of the pelvis and projects by a portion of its lower end, the cervix, into the vagina. It is situated between the bladder in front and the rectum behind. The upper end, the fundus, is usually just below the level of the plane of the brim of the pelvis and about 2 cm. in front of the sacrum. The position of the uterus is dependent upon the condition of the surrounding organs. When the bladder is empty and the rectum undistended, the uterus is slightly anteflexed, and occupies a position at a

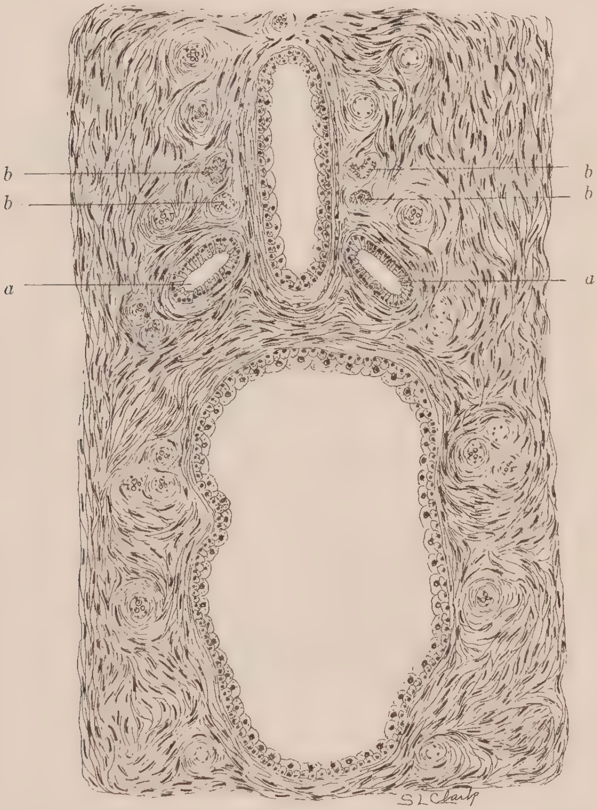


FIG. 22.—Horizontal Section of the Vagina and Urethra of an infant.
a, *a*. Skene's glands. *b*, *b*, *b*, *b*. Urethral glands; the analogue of Littre's glands in the male.

right angle to the axis of the vagina. The fundus is directed forward and upward, and the cervix downward and backward, toward the rectum. A distended bladder raises the fundus and decreases the uterovaginal angle. A similar change of position is induced by rectal accumulations which push the cervix forward. Necessarily, therefore, it is difficult to determine between a physiologic and a pathologic position. We may call any position abnormal in which the organ becomes fixed and the range of mobility lessened. The uterus presents from above a pear-shaped appearance. It is slightly flattened from before backward with its posterior surface convex.

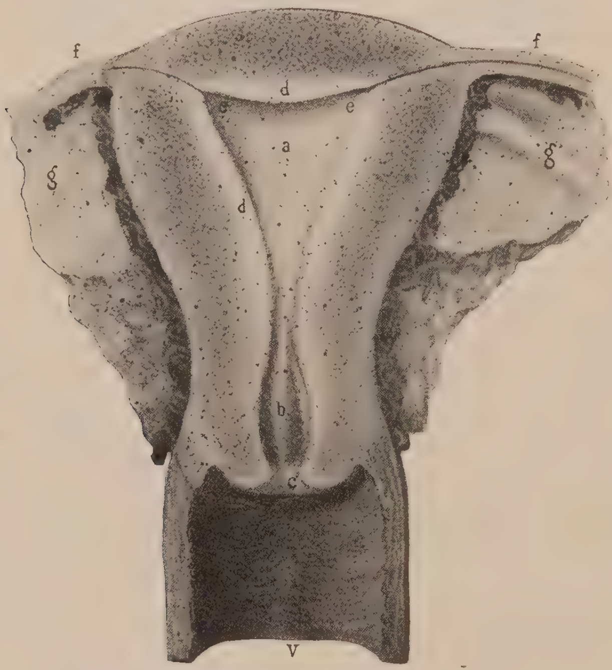


FIG. 23.—Median Section of Uterus from Side to Side through the Fallopian Tubes. Mode of Junction of Vagina and Uterus. (*Savage.*)
a. Uterine cavity. b. Cervical canal, showing folding of its mucous membrane. d. Internal uterine (mucous) coat. c. Os externum uteri. e. Uterine aperture to Fallopian tube. f. Fallopian tube near uterus. g. Round ligament. V. Vagina.

The length of the virgin uterus is from 5 to 7.5 cm.; its breadth at the orifices of the Fallopian tubes, 5 cm.; and its walls are about 1 cm. thick. The weight of the nonimpregnated uterus is from about 300 grains to 1 1/2 ounces. The organ is divided into two portions—the body and the cervix. The body, pyriform in shape, about 4 cm. long, is surmounted above a line drawn through the orifices of the Fallopian tubes, by a rounded portion—the fundus. The cervix, cylindric in form, is about 3 cm. long and terminates below in the vaginal portion. Schröder divides the cervix into three parts: the upper and lower, called the supravaginal and infravaginal portions, which are separated by an intermediate portion—a division which is of significance in the study of uterine displacements.

The attachment of the vagina to the uterus is much higher behind. When the patient occupies the dorsal position, with the limbs well drawn up, the vagino-uterine junction is upon a plane vertical to the horizon. The infravaginal portion of the cervix is especially interesting to the gynecologist, as it is the only part of the uterus which is visible upon inspection, and fully accessible to palpation. It varies extremely in size and shape, according to the age and sexual relations of the individual. In the virgin it presents a conoid projection, nearly 1 cm. long, with an opening in its apex, known as the external os, or os tincæ. The os is a transverse slit, about two or three millimeters long, and it divides the cervix into an anterior and a posterior lip. The anterior lip is the longer.

With the advent of sexual activity the cervix changes. In the nulliparous married woman it becomes softer and larger, the conoid shape is less marked, and the os stands more widely open. In the multipara, even when lacerations have not occurred, the cervix is large and soft, and the os presents a transverse slit—more frequently an irregular opening. Inflammatory lesions cause the cervix to become still larger, with eversion of the mucous membrane, erosion of the surface, enlargement of the papillæ, and an irregular opening.

With the cessation of menstruation, and especially in women who have borne a large number of children, the vaginal cervix disappears and the os is flush with the fornix of the vagina.

The junction of the triangular body and conoid cervix is called the isthmus. The anterior surface is flattened; the posterior, quite convex. The upper border of the uterus is rounded, and forms the fundus. The lateral uterine borders are obscured by the folds of the peritoneum, known as the broad ligaments. The upper part of each ligament is occupied by the Fallopian tube; below this, the round ligaments; and still lower, the ovarian ligament.

The arteries, veins, and lymphatics of the pelvis pass through the broad ligament.

The uterine canal in the virgin (Fig. 24) is about 5 cm. long; slightly longer in the multipara. The cavity of the cervix is cylindric, wider in the center and narrower at each end, with the external os below and the internal os above.

The cavity of the body is triangular from side to side, but the anterior and posterior surfaces lie in contact. At the apex of each angle of the triangle is found an opening, on each side the orifices of the Fallopian tubes, and below the internal os.

The uterine wall has a thickness of a little more than 1 cm. The uterus has three layers—an external (serous), a median (muscular), and an internal (mucous membrane). The serous or peritoneal covering is not complete, and, therefore, will be considered with the peritoneum.

The muscle-fibers are best studied in the pregnant uterus, and may be divided into three layers. The external is most distinct, and consists of a fine, thin layer over the anterior and posterior surfaces, from which prolongations are sent off into the broad ligament. The posterior fibers form the ovarian ligament, and the anterior the round ligament. Some of the fibers also furnish the longitudinal muscular structure of the Fallopian tube. These fibers are wanting upon the sides of the uterus. The middle layer is by far the thickest, and consists of interlacing fibers, transverse and longitudinal, which are continuous with those of the vagina. This layer comprises the principal part of the wall, and contains the blood-vessels. The latter are embedded in a network of fibers, and are visible to the naked eye upon cross-section. Their intimate relation to the muscle and tissue is recognized by their remaining open when divided transversely.

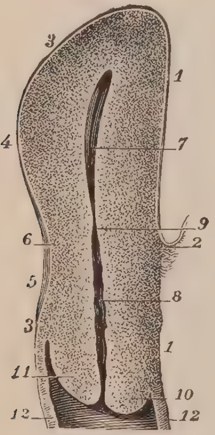


FIG. 24.—Virgin Uterus, Median Section. *Byford after Sappey.*

1. Anterior surface. 2. Vesico-uterine pouch. 3, 3, 4, 5, 6, Posterior surface. 7. Cavity of corpus. 8. Cavity of cervix. 9. Os internum. 10, 11. Vaginal portion of cervix. 12, 12. Vagina.

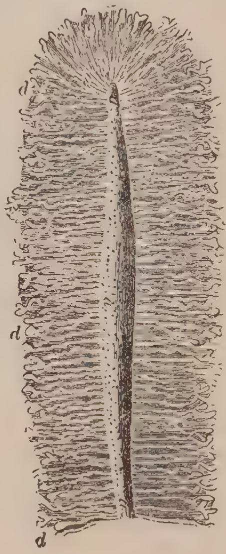


FIG. 25.—Mucous Membrane of Uterine Body showing Follicles. *Mann.*

d, d, d. Simple or double culdesac of these follicles. *a, a, a.* Thin cup-shaped orifice upon the mucous membrane.

The inner layer consists of circular fibers, which are most marked at the internal and external os, where they form a sort of sphincter, and at the cornu of the uterus, from which they are extended into the Fallopian tubes.

The connective tissue of the uterus is thickly interspersed between the muscle-fibers, and especially along the course of the vessels. The mucous membrane of the uterine cavity rests directly upon the muscle layer without any intervening submucosa, and its glandular structure projects between the muscle-fibers. In the cervical cavity, where the mucosa is thrown into folds, a distinct areolar layer intervenes between it and the muscular wall. The uterine mucosa is one millimeter in thickness at the fundus, but becomes thicker near the center of the cavity. It is smooth and velvety, of a grayish-red color, and presents no folds, unless in the immediate vicinity of the tubal opening, and there but a slight folding. Under a glass can be seen numerous small depressions or openings—the orifices of the glands. The free surface of the mucosa is covered with a single layer of columnar epithelial cells, which are supplied with cilia.

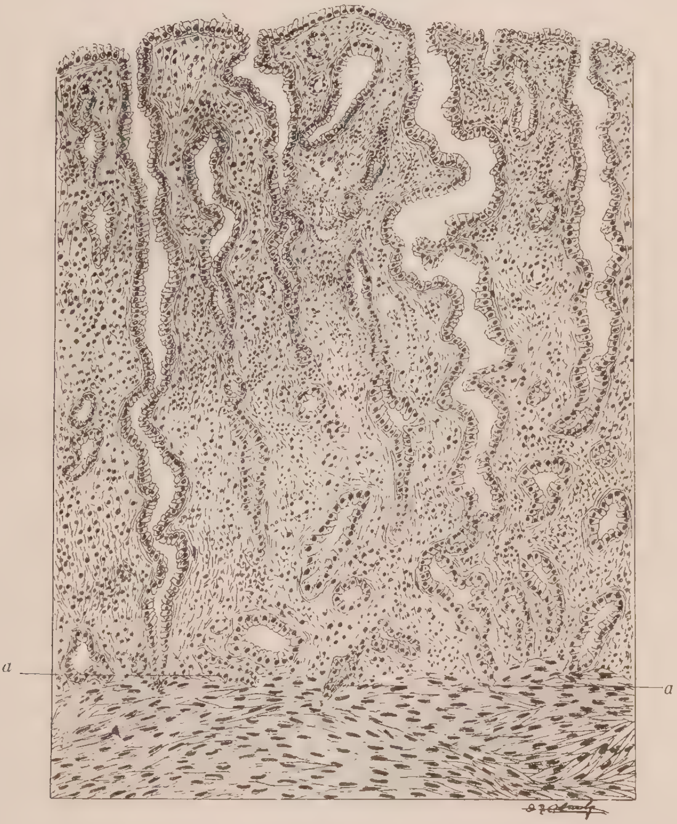


FIG. 26.—Section of Normal Endometrium. Note two glands to right somewhat enlarged.
a, a. Glands penetrating muscular substance.

The mucosa is filled with glands of the tubular variety, which penetrate its entire thickness, and frequently their external extremities are embedded in the muscular layer. (See Fig. 25.) The direction of these tubules is more or less oblique. They often exist as sinuous or spiral single tubes, but more frequently divide into two or more branches near their lower ends. Upon longitudinal section they exhibit a basement membrane lined by a single layer of prismatic ciliated cells with single layer nuclei situated near their bases. (See Fig. 26.) There glands largely increase with the approach of puberty, and become elongated during menstruation, especially in pregnancy. The mucosa is supplied with large plexuses of capillaries and lymphatics. The latter, in the forms of lymph-spaces, are directly connected with the lymph-sinuses and vessels of the deeper layer. The termination of the nerve-filaments in the mucosa has not been determined, but the action of the glands indicates their reception of nerve-filaments, as in similar structures of other parts of the body.

The cervical mucosa, thicker than that of the body, is thrown into several folds, known as the arbor vitæ, or plicæ palmatæ, and is separated by a submucosa from the muscular wall. This arrangement of the mucosa ends sharply at the internal os, and is best observed in the virgin cervix. The mucosa differs from the lymphoid structure of the body in having a firm, fibrous basement membrane, surmounted by cylindric epithelial cells. These cells, according to De Sinety, are ciliated only upon the summit of the ridges, while the epithelium covering the intervening surfaces is nonciliated. The glands are of the racemose variety, consisting of branching ducts. They are lined with nonciliated cuboid epithelium, resting upon a structureless basement membrane. They open on the free surface, upon and between the folds, and secrete a clear, viscid, alkaline mucus. The ovula Nabothi are those glands of Naboth which have formed small cysts after occlusion of their ducts.

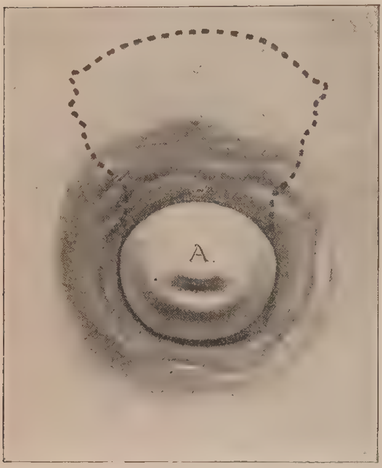


FIG. 27.—Virgin Os and Cervix. (*Sappey.*)

The structure of the cervical wall differs from that of the body in the increase of fibrous tissue, which is intimately interwoven with the muscle fiber, and in the lessened supply of blood-vessels.

The external os presents a sharp line of demarcation separating the one-layered cylinder epithelium of the cavity from the multiple-layered pavement epithelium of the vaginal portion.

The Fallopian tubes, or oviducts, are two tortuous canals which arise from each side of the fundus uteri. They vary in size and length, occupy the upper margin of the broad ligament, and extend outward almost to the pelvic brim. The length of the tube is from 7.5 cm. to 12.5 cm., the right tube usually being the longer.

They are first directed outward, then backward, and finally inward, giving the appearance of a shepherd's crook. The tube presents for our study: 1, in the uterine cavity a narrow, funnel-like opening, the *ostium uterini tubæ*; 2, the section of the canal found in the uterus, *pars uterini;* 3, the narrow portion proximal to the uterus, the *isthmus tubæ*; 4, a wider, longer, more tortuous portion, the *ampulla tubæ*, which terminates in

5, a distinct trumpet-shaped end, the *infundibular tubæ*, provided with numerous fimbriæ; and 6, a distinct opening from the ampulla, the *ostium abdominale tubæ.* The line of differentiation between the pars uterini, isthmus, and ampulla is not sharply defined. The isthmus is the narrowest portion and is about two centimeters long. The diameter of the isthmus is about two millimeters, and its lumen will scarcely admit a bristle. The ampulla is the more widened part. It extends outward and backward, has an external diameter of six to eight millimeters, and its lumen a diameter of two or three millimeters.

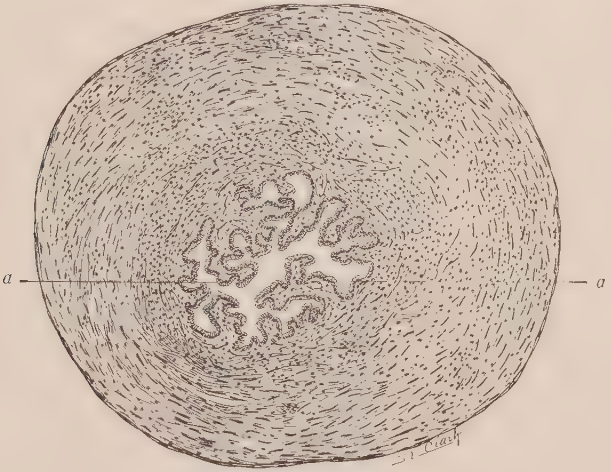


Fig. 28.—Section of Fallopian Tube through the Isthmus.
a, a. Shows the firm and compact structure of the longitudinal folds in this portion of the tube.

The fimbriated extremity—also called the pavillion, or infundibulum, from its funnel shape, and the morsus diaboli (devil's mouth)—is a trumpet-shaped opening, surrounded by primary and secondary fimbriæ resembling the tentacles of the sea anemone. The primary fimbriæ are the larger processes, four or five in number, from which arise the eight or ten secondary processes.

The longest fimbria (fimbria ovarica) anchors the tube to the ovary and has a furrowed groove, which facilitates the passage of the ovum to the tubal orifice. The broad ligament is continued to the lateral wall of the pelvis by a small fibrous band, known as the infundibulopelvic ligament.

The tube, upon repeated section, will be found to have varying dimensions, and frequently its course is tortuous—almost convoluted. It has two openings: the uterine and the abdominal. The latter is more distensible than the remaining portion of the tube, is somewhat trumpet-shaped, and affords a communication with the peritoneal cavity.

The tube consists of four coats or layers: the external, serous covering which is separated from the muscular layer by a subserous coat, the tunica adventitia; next a muscular; and lastly the internal—the mucous membrane.

The external serous covering is incomplete, that portion of the tube toward the broad ligament being incomplete for the inner two-thirds of the tube. The remaining third is surrounded by the peritoneum, which covers the external surface of the fimbriæ, while the internal is lined by the mucosa. The tunica adventitia envelops the muscular layer, allowing the peritoneal to slip over its abdominal end. The muscular coat consists of longitudinal and circular fibers. The former is continuous with the outer; the latter, however, is predominant and a continuation of the inner muscular layer of the uterus. The muscular structure is more largely developed at the proximal than at the distal end of the tube, and the circular fibers are particularly well marked at the isthmus, where they form what is called the sphincter tubæ. The tubal mucosa is quite thick, thrown into longitudinal folds, very vascular, and of a bright red color. In the isthmus the mucosa presents simple folds, which become more complex in the ampulla. Hennig has counted from three to five primary folds, which have between eight and ten smaller plicæ between each pair of the former. The secondary folds are less marked near the abdominal extremity, where the longitudinal folding is apparent to the naked eye.

The mucosa has a single layer of ciliated columnar epithelium upon two or three layers of supporting cells, which are round or pyriform. The cells terminate abruptly at the ends of the fimbriæ, where the margin between the columnar and pavement epithelium is marked distinctly. The tubal mucosa, like the uterine, has no distinct submucous layer but, unlike the latter, it is without glands, and is covered with a thin layer of grayish mucus of a distinctly alkaline reaction.

The ovaries, the germ-bearing organs of the woman, are a pair of small bodies analogous to the male testicle. One is situated on the posterior surface of each broad ligament, below the tube and at each side of the uterus.

The ovaries occupy a position at the level of the brim of the pelvis, or partly below and partly above its plane.

The axes of the ovaries lie obliquely to the pelvis, with a slight inclination forward. In the erect position they rest upon the posterior surface of the broad ligament.

The Fallopian tube is situated in the broad ligament above and partly encircling the ovary, while the round ligament is in front and occupies its anterior fold. In front, between the ovary and the tube, is the parovarian structure or the organ of Rosenmüller. The inner or uterine extremity of the ovary is connected with the uterus by some muscle fibers, about three centimeters long, known as the ovarian ligament; the outer or tubal extremity is connected above with the end of the tube through the fimbriæ ovarica, and below with the infundibulopelvic ligament.

The ovary presents a flattened, avoid appearance, with its broad end directed externally and the pointed end toward the uterus. The anterior straight, or flattened, surface of the ovary is fixed by a short serous duplication, the mesovarium, to the posterior surface of the broad ligament. The posterior convex margin is free. Its size varies with the age of the individual, the functional activity of the organ, and the occurrence of menstruation or pregnancy. The ovary attains its greatest size about six weeks after parturition (Hennig), and never returns to its former size in the subsequent involution.

Following the menopause, it shrinks to one-half or one-third of its dimensions during active sexual life. Luschka gives as its dimensions: length, 4 cm.; width, 2.2 cm.; thickness, 1.3 cm. It weighs from 60 to 135 grains.

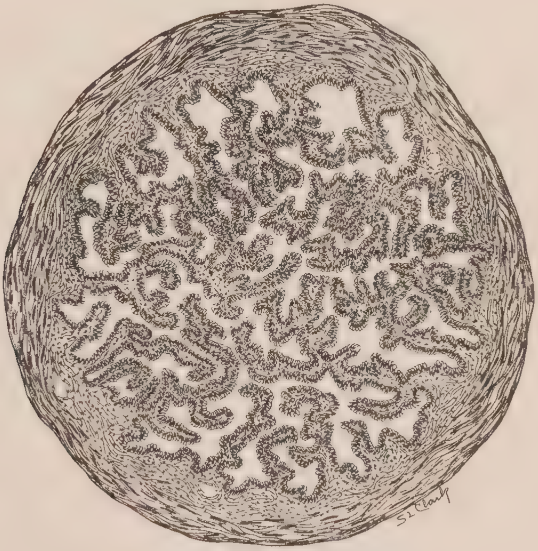


FIG. 29.—Section of the Fallopian Tube through the Ampulla near the Isthmus, Showing Extensive Folding of the Mucous Membrane.

The color of the ovary is a pinkish-gray, becoming somewhat darkened as menstruation approaches. Immediately after ovulation a dark swelling follows, due to the accumulation of blood. As absorption progresses the color changes and the mass becomes yellow, and later presents only a whitish cicatrix. Before puberty the ovary is smooth, but subsequently it becomes irregular, from the cicatrices following repeated rupture of cysts, or nodular, from the presence of matured follicles that have failed to rupture. Following the menopause, the ovary becomes a pearly-white, irregular, almost cartilaginous mass, about one-half or one-third its former size.

The ovary is situated upon the posterior surface of the broad ligament, with its pointed end connected with the uterus by the ovarian ligament. The ovary, by its pointed end, is directed toward the ligament, and its stroma extends inward upon the latter, while the external ovarian end is blunt and large. The posterior surface of the ovary projects through the peritoneum and is uncovered by it. The union of the columnar epithelium of the ovarian surface with the pavement epithelium is readily recognized as a white line, and is called the white line of Farre.

Sections of the healthy ovary show two kinds of tissue; a central or medullary, and a cortical or peripheral portion. The latter covers the entire surface of the ovary bounded by the line of Farre, but projects to its greatest depth (two to three millimeters) at the central portion of the convex surface. The central structure has a pinkish-gray or rosy color, is of soft consistence, and has a moist, glistening appearance. It is of a white or grayish-white color, more or less firm in consistency, and contains numerous small vesicles. The smaller vesicles are situated near the surface, while larger cysts are situated deeper. Some of these reach the size of a pea, and may project more or less beyond the free surface. The sac-wall is frequently so thin that the vesicles rupture under the slightest pressure. This layer also contains numerous depressions or scars, the result of repeated ovulation.

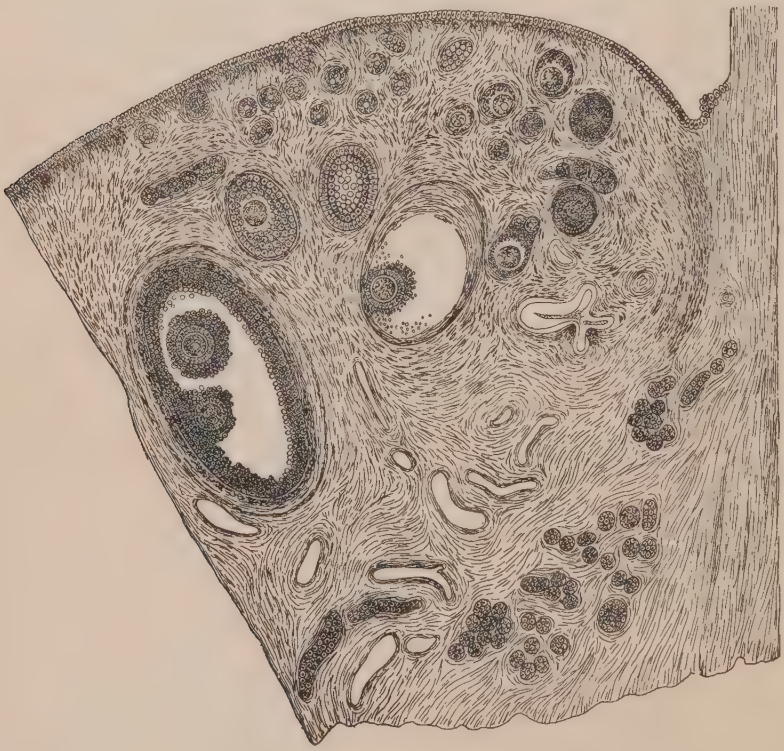


FIG. 30.—Section of Ovary, Showing Graafian Follicles. (*Wyder.*)

The cortical layer of the ovary, or that part which projects through the peritoneum, is covered by a single layer of short, columnar epithelium, called by Waldeyer the germinal epithelium. This undergoes a transition at the white line to the pavement-epithelium of the peritoneum. Before puberty young ova are represented by large spheroid cells, with marked nuclei, which form in the columnar cells. Ingrowths of the germ epithelium into the underlying stroma are occasionally seen, which form the ovarial tubes of Pflüger.

Immediately beneath the epithelial layer, and quite inseparable from the underlying stroma, is the tunica albuginea. This is a thin, dense layer of fibrous tissue, which contains a few smooth muscles-fibers. It is not completely developed until the third year, and undergoes changes with age and inflammation until it becomes thickened and of almost cartilaginous hardness, which renders its rupture exceedingly difficult. Such alterations from inflammatory changes are a cause of the formation of retention cysts, and of the development of that condition known as cystic disease of the ovaries. The structure of the ovary, as already noted, is divided into a cortical and a medullary portion, although they differ but little in structure except that the latter is softer and more vascular. In the cortical layer lie the Graafian follicles, embedded in connective tissue interspersed with some muscle-fibers. A large number of these follicles, variously estimated at from 36, 000 to 400,000, are found in each ovary. Whether so large a number exists is difficult to determine, but it remains evident that nature has amply provided for the reproductive function.

The ovarian stroma is the framework or bed in which the follicles rest and are nourished. Each Graafian follicle has a wall, which consists of a tunica fibrosa of thin fibrous tissue, within which is a more delicate membrane, called the tunica propria; the latter contains many granular cells and a fine network of capillary vessels. This tunica propria is lined with several layers of epithelial cells, called the membrana granulosa, separated from the tunica propria by a structureless membrane. These epithelial cells form a thickened mass upon one side, which projects into the cavity—the discus proligerus. The cavity of the follicle is filled with a clear, serous fluid, called the liquor folliculi. It is formed by liquefaction of the cells of the membrana granulosa.

The Graafian follicle, when mature, is one millimeter in diameter. Embedded in the discus proligerus is found the ovum, which has been called the typical cell; it measures from 0.2 to 0.3 mm. It is a yellow, spheroid body, enveloped by a thin, delicate membrane—the vitelline membrane, or zona pellucida—doubtless formed from the innermost cells of the discus proligerus. Within this membrane is contained the vitellus, a network of granular, fibrillated protoplasm containing numerous fat-globules. In the outer portion of this network is a light spot, which consists of fine, fibrillated protoplasm, which contains in its meshes a granular material inclosed in a distinct membrane. This structure is known as the nucleus, or germinal vesicle. Within this is contained a small, highly refracting, granular body, known as the nucleolus, or germinal spot.

The Graafian follicle is surrounded by a vascular network; as it matures, the liquor folliculi increases, the cyst becomes tense, approaches the surface, and the tunica albuginea becomes thinned and finally ruptures, permitting the ovum to escape. The cavity of the follicle fills with blood, which coagulates and forms a clot. Later, this clot presents an external yellowish color, while its center is of a reddish-gray hue. The clot gradually becomes organized, contracts (by which it is thrown into folds), and is gradually absorbed. The clot thus formed is known as the corpus luteum. The ovary of a normally menstruating woman will be found to contain a number of corpora lutea in various stages of retrogression. The structure generally disappears by the end of the twelfth week, excepting a small cicatrix, the corpus albicans, which remains.

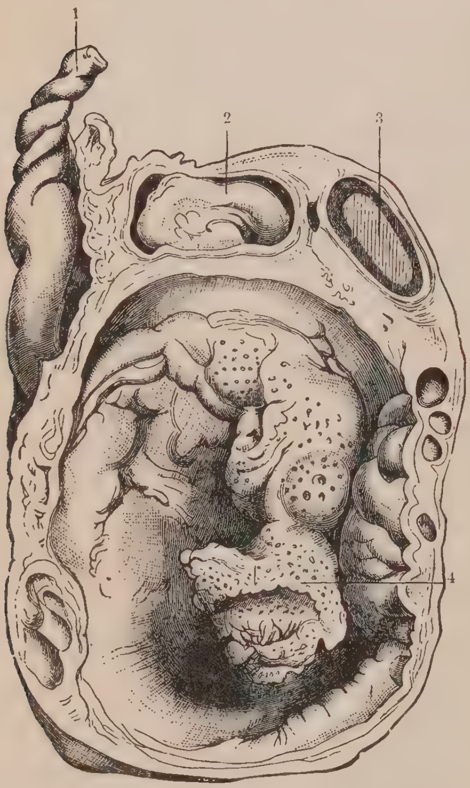


FIG. 31.—Large Corpus Luteum in Association with an Ovarian Dermoid. Removed from an Unmarried Woman Who Had Never Been Pregnant. (*Sutton*).

1. Twisted pedicle. 2. Corpus luteum. 3. Old clot. 4. Integumentary surface of dermoid.

When pregnancy occurs, the corpora lutea do not continue to form, but the one corresponding to the last menstruation becomes much larger and remains longer. It continues to increase, and after the first month forms a large yellow clot, which gradually becomes decolorized and more highly organized, resulting in a white, fibrinous clot surrounded by a yellow ring. The corpus luteum of pregnancy is known as the corpus luteum verum, while those which occur with ordinary ovulation are called corpora lutea spuria.

Later in the pregnancy, the time of which is not exactly known, it becomes contracted, and at its termination forms a mass about 0.5 cm. in diameter.

When the corpus luteum has lost its color, most of its blood-vessels, and is mainly composed of a mass of fibrous tissue, it is called a corpus albicans. Frequently, from the retention of pigment, it is dark in color, and is known as a corpus nigricans. Clark has shown that the corpus luteum finally disappears by the process of hyaline degeneration. Extravasations of blood, or apoplexy of the ovary, as we shall see later, are not infrequent, and occasionally may result in the complete destruction of the organ and the formation of a blood-sac—an ovarian hematoma.

The Parovarium. Between the external end of the tube and the ovary is situated a triangular group of small tubules, known as the parovarium, or the organ of Rosenmüller—a remnant of the Wolffian body. The structure corresponds to the epididymis in the male.

The apex of the triangle is directed toward the ovary. This organ is of especial importance to the gynecologist, as it can be the seat of a number of growths. It consists of six to thirty spiral tubules, which at their base open into a single transverse tube. This transverse tubule corresponds to the canal of Gärtner in the lower animal. Cysts are frequently found associated with the tubules; the most common is the hydatid of Morgagni, or appendix vesiculosa, the pedicle of which arises in a point of the mesosalpinx, near the fimbria ovarica. The occurrence of this cyst is the rule rather than the exception, and it consists of a tough, connective-tissue wall with a well-developed vascular system, and is lined with pavement epithelium. It has a pedicle one-third centimeter long and contains clear fluid. The parovarium is entirely a rudimentary structure and has no function.

Urinary Organs and Rectum. Our knowledge of the relations of the pelvic organs will be incomplete without a study of the analogy of the urethra, bladder, and ureters, as well as of the rectum and anus.

The urethra is a canal, from 2.5 cm. to 4 cm. long, which forms the outlet to the bladder. It lies embedded in the anterior vaginal wall, from which it can readily be separated. It is slightly curved upward, with its concavity forward. Upon cross-section the urethra presents a transverse slit near its vesical end and a stellate folding toward the external meatus. The diameter of the urethra is 0.6 cm., and it is quite distensible. When not distended, the urethral mucous membrane is more or less corrugated throughout its length, owing to the sphincter-like action of the surrounding muscle-fibers. The urethra is attached to the pubic arch by the pubovesical ligament, and penetrates the triangular ligament, between the layers of which it is surrounded by the fibers of the compressor urethræ, or muscle of Guthrie.

It is also, together with the vagina, influenced at its lower end by the bulbocavernosus muscle. Its external opening is known as the external meatus, and close inspection of its orifice will reveal a number of small openings about it—the orifices of the glandulæ vestibulares minores. Within the meatus are two small openings—the orifices of the tubules, described by Skene. They correspond to the lacuna magna in the fossa navicularis of the penis.

They are described by Skene as tubules which extend for a distance of nearly 1 cm. paralled with the urethra. As a result from inflammation they can be so dilated that they will admit a No. 1 probe, and even the point of a catheter.

The urethra is nearly parallel with the bladder, but when the woman is erect, it is nearly vertical.

The urethral mucous membrane, like that of the vestibule, is of the pavement variety. The glands are lined at their mouths with pavement epithelium, which soon changes into the columnar variety.

The bladder is situated in the anterior part of the pelvis, between the symphysis pubis in front and the vagina and uterus behind. Its shape is constantly changing with the accumulation and evacuation of the urine. When empty, the urethra forms the stem of a Y, the anterior limb of which is the longer. Between the urethra, the anterior surface of the bladder, and the symphysis is a triangular space filled with the retropubic fat. The bladder, when moderately distended, becomes rounded; and when full, oval. The female bladder holds less than that of the male, and differs from it also in having the transverse diameter longer than the vertical. The bladder is divided into three portions:

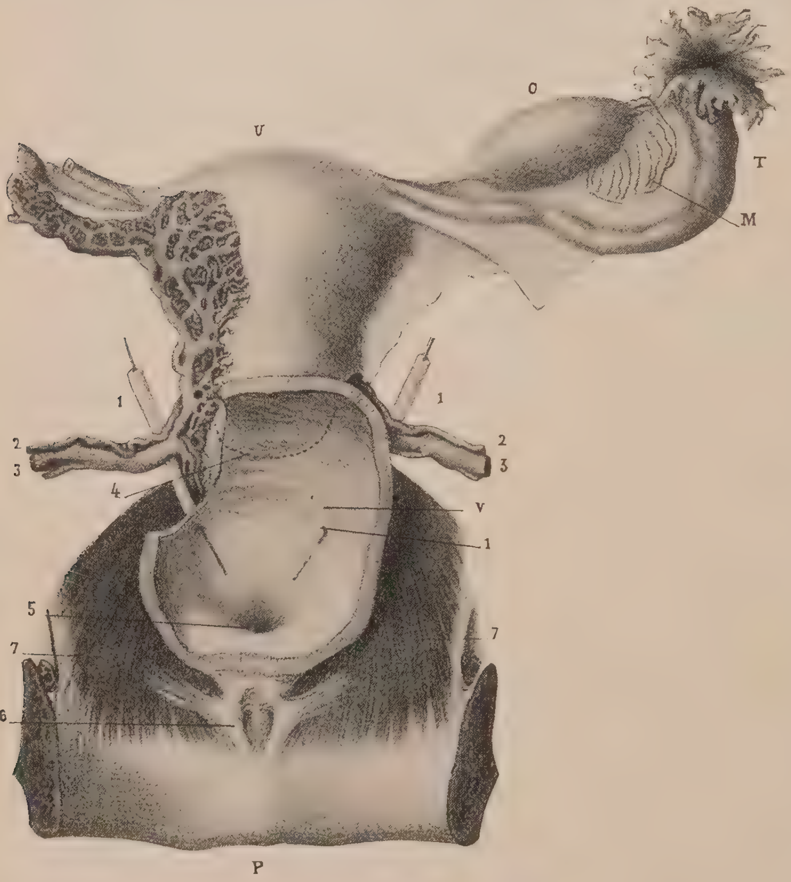


FIG. 32.—Vesicovaginal Septum and Base of Female Bladder. Anatomic Relations of Ureters at Their Entrance into the Bladder. Contents of Alar Ligament. (*Savage*).

1, 1. Ureters. 2, 2. Uterine artery. 3, 3. Uterine veins. 4. Dotted line indicating the vaginal end of the uterine cervix. 5. Internal meatus urethræ. 6. Ligamentous process of fascia of pubococcygeus muscle and vesicopubic muscles. 7, 7. Pubococcygeus muscle. U. Uterine body. O. Ovary, utero-ovarian muscular ligament, and grooved Fallopio-ovarian fimbriæ. T. Fallopian tube and fimbriæ inverted. M. Parovarium. P. Pubic arch. V. Body of bladder.

the body, the base or fundus, and the neck. Skene defines the first as that portion which lies above a plane formed by the ureteric openings and the center of the symphysis pubis. The portion below is the fundus, or base, which includes the trigone, or space between the orifices of the ureters and internal meatus, and the bas fond, the space immediately behind the ureters. The thickened surface about the urethral orifice is the neck, which is the most dependent portion when the body is erect.

The bladder-wall consists mainly of muscular structure. The wall, dependent upon the amount of distention, varies from 0.5 to 1 cm. The muscular structure consists of longitudinal and circular fibers, the former mostly confined to the anterior and posterior surfaces. They may be traced from the vesical neck and pubes in front, where they are called the musculi pubovesicales, to the summit, where some of the fibers accompany the urachus.

The circular fibers are more marked near the vesical orifice, where they form the sphincter vesicæ.

The muscular layer is partly covered externally by the peritoneum, which will be discussed later, and internally by the mucous membrane, with which it is loosely connected by a layer of fibrous and elastic tissue. Because of this loose connection, when the bladder is empty the mucous membrane is thrown into folds, except at the trigone, where it is more intimately connected with the submucous layer and is much thinner.

The mucous membrane in life presents a rosy pink appearance, and is continuous with that lining the urethra and ureters. Its epithelium consists of three or more layers of epithelium resting upon a basement membrane. The superficial cells are squamous, but are smaller than the vaginal. The inferior layer is composed of columnar epithelium with long processes, while the middle one is made up of pyriform cells. The membrane is supplied with a rich plexus of fine capillaries and nerve-fibers. The latter are not marked in the trigone.

The bladder is but poorly supplied with lymphatics, and they communicate with the glands near the internal iliac artery.

The ureters are the urinary ducts through which the urine is carried to the bladder. Their course, previous to crossing the iliac arteries, is nearly parallel. The left ureter lies behind the sigmoid flexure of the colon. In their subsequent course the ureters extend downward, backward, and outward along the lateral walls of the pelvis. At the spine of the ischium they bend downward, forward, and inward to the bladder, passing behind the uterine arteries, and about 1 to 1.5 cm. on each side of the cervix. The distance between the ureters where they enter the bladder is 5 cm. They pass obliquely through the vesical wall and enter the bladder 2 cm. below and external to the cervix, where their orifices are still 4 cm. apart, but united by a prolongation of the longitudinal fibers of the ureter, known as the interureteric ligament. This ligament forms a transverse ridge between the two orifices, and serves as the base of the vesical triangle.

The rectum is the lower extremity of the large intestine, and begins with the termination of the sigmoid flexure, at the level of the third sacral vertebra, to end with the anus. The rectum in its course from the third sacral vertebra is directed downward and forward behind the cervix uteri and vagina, parallel with the latter, until it turns directly backward at the anus. The relation of the rectum to the pelvic structures naturally divides it into two portions, the pelvic and the perineal portion. The pelvic portion begins opposite the third sacral vertebra and ends at the insertion of the levator ani into its wall. The perineal portion lies between the muscle and the anus. The space formed by the deviation of the rectum from the line of the vagina is occupied by the perineal body. The portion of the rectum involved in this deviation, which is about 2.5 cm. long, is known as the anus.

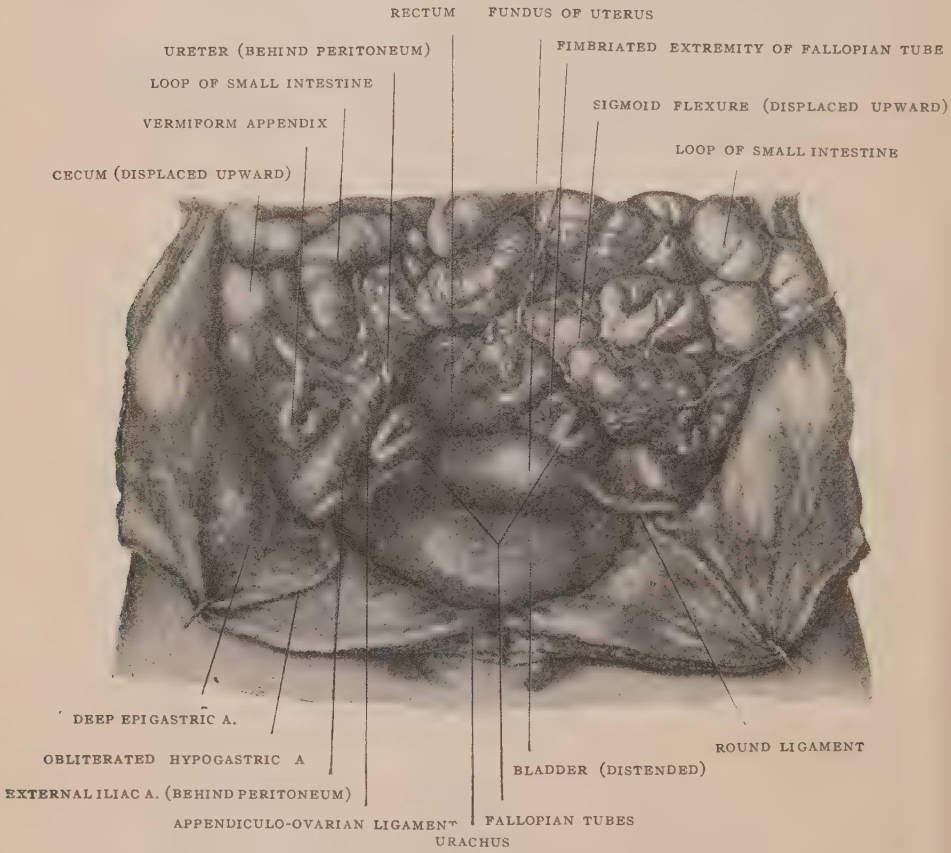

RECTUM
FUNDUS OF UTERUS
URETER (BEHIND PERITONEUM)
FIMBRIATED EXTREMITY OF FALLOPIAN TUBE
LOOP OF SMALL INTESTINE
SIGMOID FLEXURE (DISPLACED UPWARD)
VERMIFORM APPENDIX
LOOP OF SMALL INTESTINE
CECUM (DISPLACED UPWARD)
DEEP EPIGASTRIC A.
ROUND LIGAMENT
OBLITERATED HYPOGASTRIC A
BLADDER (DISTENDED)
EXTERNAL ILIAC A. (BEHIND PERITONEUM)
APPENDICULO-OVARIAN LIGAMENT
FALLOPIAN TUBES
URACHUS

FIG. 33.—Superior View of the Pelvic Cavity. (*Deaver*).

The entire length of the female rectum is twenty centimeters. The canal is less curved than in male, and its caliber is greater. The longitudinal muscular bands so characteristic of the colon are absent.

The rectum, artifically distended, shows a very large sac, immediately above the anus, which decreases as the sigmoid flexure of the colon is approached. This very dilatable portion is called the ampulla, and when empty, the anterior surface lies in contact with the posterior, so that upon transverse section it presents a transverse slit.

The anal orifice is quite dilatable. The anus forms an aperture which closes with its lateral surfaces in contact. The orifice is further obstructed by eight or ten longitudinal folds of the mucous membrane. These folds are called the "columns of Morgagni," and the depressions between them, the "sinuses of Morgagni." These corrugations are produced by the contraction of the sphincter, and disappear when the anus is distended. Above the anus are three ring-like zones which are superimposed over each other. The first is the zone of the rectal columns and the intervening sinuses. The mucous membrane upon the surfaces of the columns is covered with pavement epithelium, while in the depressions cylindrical epithelium similar to that of the bowel above is found. Lieberkühn's crypts are seen only in the upper portion of this zone. Its boundary is often recognized as a distinct line, the linea ani rectalis (Hermann). The middle zone has a smooth, bright mucous membrane covered with pavement epithelium and small papillæ. The lower zone is the cutaneous zone. This has the horny epithelium well supplied with pigment and also connective-tissue sublayer characteristic of the skin. We find here papillæ, hair, and sebaceous glands adjoining the larger convoluted glands of the intestine. The submucous layer consists of a structure of quite dense connective tissue, in which are situated the blood-vessels, nerves, and lymphatics. Its laxity permits the mucous membrane to glide over it. The mucous membrane of the rectum above the anal canal has three or four large permanent transverse or oblique semilunar folds which often project quite a distance into the lumen of the bowel. These folds, according to Gant, are crescent-shaped, capable of some vertical motion, and extend about one-half to two-thirds the circumference of the rectum and project into its lumen from three-fourths of an inch to an inch and a half. They are situated obliquely to the long axes of the bowel. They are slightly cup-shaped with the concavities looking upward. With the bowel distended the free margins of these valves are prominent and readily seen through the proctoscope. They are called Houston's valves. The number of them is variable; usually there are three. In exceptional cases there may be five, six, or even seven. Their location is fairly constant. The upper valve is situated at the junction of the sigmoid and the rectum on the left rectal wall. The middle, which is the most prominent, occupies the right anterior wall opposite the base of the bladder and is three inches or more above the anus. The lower valve is situated on the left side a short distance below the middle valve. With the patient in the knee-chest posture and the rectum well inflated one can often see, by the aid of the proctoscope, all these valves at the same time. They generally form a sort of spiral stairway which gives a rotatory motion to the fecal mass as it progresses toward the anus.

The rectal wall is composed of three coats—the peritoneal, the muscular, and the mucous membrane.

The arrangement of the serous coat will be considered with the peritoneum, but it should be remembered that a portion only of the rectum is enveloped by peritoneum. The muscular layer consists of longitudinal and circular fibers, but the former are more generally distributed, and not collected into bands, as in the colon. The circular fibers are deeply situated, and are more marked just above the anus, where they form a distinct ring, nearly half an inch in width, which is recognized as the internal sphincter. The submucous layer consists of a layer of quite dense connective tissue in which are situated the blood-vessels, nerves, and lymphatics. Its laxity permits the mucous membrane to glide over it. The mucous membrane is continuous with that of the intestine, although much thicker and more movable than that of the colon, and its great vascularity causes it to have a bright pink or even red color.

The mucous membrane is lined with columnar epithelium, and contains a large number of Lieberkühn's follicles, but no villi. The mucous membrane at the anus abruptly changes from the columnar to the pavement epithelium of the skin, which forms the so-called white line.

9. Pelvic Peritoneum. That portion of the serous lining of the abdominal cavity which is situated within the pelvis, and envelops the pelvic organs, is known as the pelvic peritoneum. Upon examination of a mesial section it will be seen to leave the anterior abdominal wall about 3 cm. above the symphysis and be reflected upon the fundus of the bladder. It covers the posterior surface of the bladder to the level of the internal os, and as much of the lateral surface as lies behind the obliterated hypogastric arteries. (Fig. 34.) From the bladder it crosses over to the uterus, the anterior surface, fundus, and entire posterior surface of which it invests. (Fig. 35.) Laterally from the anterior surface it extends outward upon a plane perpendicular to the pelvic brim, and is attached to the lateral wall of the cavity, thus forming the anterior fold of the broad ligament. The peritoneal investment extends over the uterus posteriorly and upon the upper part of the vagina, nearly 3 cm. below the uterovaginal junction. The lateral prolongation of this portion forms the posterior border of the broad ligament. The broad ligament contains the round ligament in its anterior fold; the Fallopian tube in its superior border, between the anterior and posterior

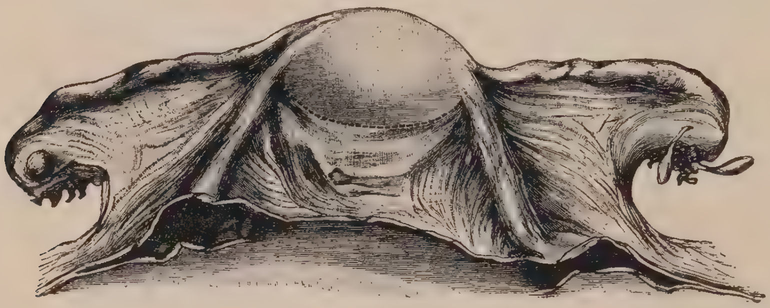


FIG. 34.—Curved Dotted Line Shows Covering of the Anterior Uterine Wall by Peritoneum. (*Winter.*)

folds; and its continuation from the termination of the tube is known as the infundibulopelvic ligament whose integrity is of importance in maintaining the ovary, and even the uterus, in position. Resting upon and projecting from the posterior fold, when the patient is erect, is the ovary, which is attached to the uterus by the ovarian ligament. The anterior and posterior leaflets of the broad ligament are separated, in addition to the structures named, by considerable loose, vascular, connective tissue, and afford entrance for the ovarian and uterine arteries and nerves, and egress for the veins and lymphatics, while its base is penetrated by the ureter on its way to reach the bladder. From the vagina the peritoneum is reflected backward, to be attached to the anterior surface of the rectum and to the tissues in front of the sacrum. Above the promontory of the sacrum it is continuous with the posterior abdominal peritoneum.

The reflection of the peritoneum over the uterus and its extension as the broad ligaments upon each side divide the pelvis into two culdesacs: the anterior, or vesico-uterine, and the posterior, or uterorectal. The posterior culdesac is further divided by a prolongation of muscular structure from the sides of the uterus backward to the iliosacral synchondrosis, over which the peritoneum is reflected. This forms a deep, cup-shaped cavity directly behind the uterus, which is known as the pouch of Douglas. This pouch dips deeper on the left side, and sometimes extends to the upper border of the perineal body. When the bladder is empty and the nonpregnant uterus lies forward, the coils of small intestine usually occupy this pouch, except at its very lowest point, and intra-abdominal pressure sometimes cause its dissection downward until a distinct hernia occurs behind the uterus. On either side, external to the uterosacral ligaments, is a fossa, which is known as the para-uterine pouch. This has been called by Polk the retro-ovarian shelf. On the side wall of the para-uterine pouch the ureter may be seen beneath the peritoneum. This space is occupied by the small intestine. During pregnancy the para-uterine pouch is lifted up to the pelvic brim, while Douglas' pouch remains unaffected. From before backward, we may find the following

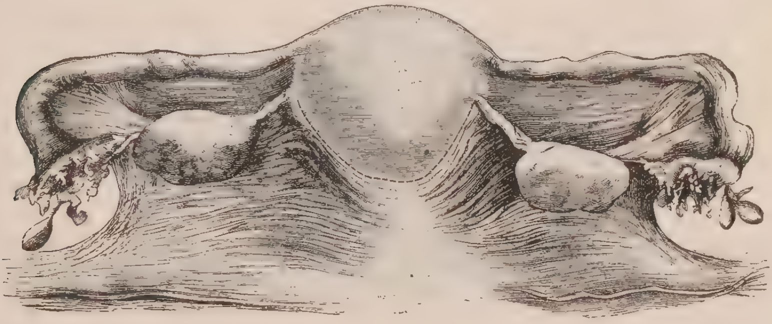


FIG. 35.—Posterior Surface of Uterus Showing Extent of Peritoneum; also Fallopian Tubes, Ovaries, and Ovarian Ligaments. (*Winter.*)

pouches or depressions: first, the pubovesical; second, the vesico-abdominal, which is seen only during distention of the bladder, and varies in depth according to the point at which the serous lining of the abdominal wall is reflected. The vesico-uterine pouch is bounded in front by the bladder; posteriorly, by the uterus. This pouch varies less than the others, on account of the firm attachment of the peritoneum to the anterior surface of the uterus. In the empty bladder the bottom of this pouch is about 3 cm. distant from the anterior culdesac of the vagina, and the pouch rises somewhat as the badder falls. The study of the female peritoneum renders it evident that it differs from that of the male in not being a closed sac, as it communicates with the uterine mucous membrane through the orifice of the Fallopian tubes, and is again perforated by the ovaries, which project through it. The close relation of the peritoneum to the pelvic viscera renders any change in this structure perilous to the normal situation and relation of these organs. Inflammatory changes result in thickening and cicatrization, which produce temporary, if not permanent, displacements. The fixation of the uterus, compression of the ovaries, and obstruction of the orifices of the Fallopian tubes are necessary sequels of such alterations. The peritoneum, according to Luschka, serves as a sort of diaphragm, dividing the pelvic cavity into two portions; the one above may be called the intraperitoneal space, and that below, the subperitoneal. In the latter is situated the greater part of the pelvic connective tissue.

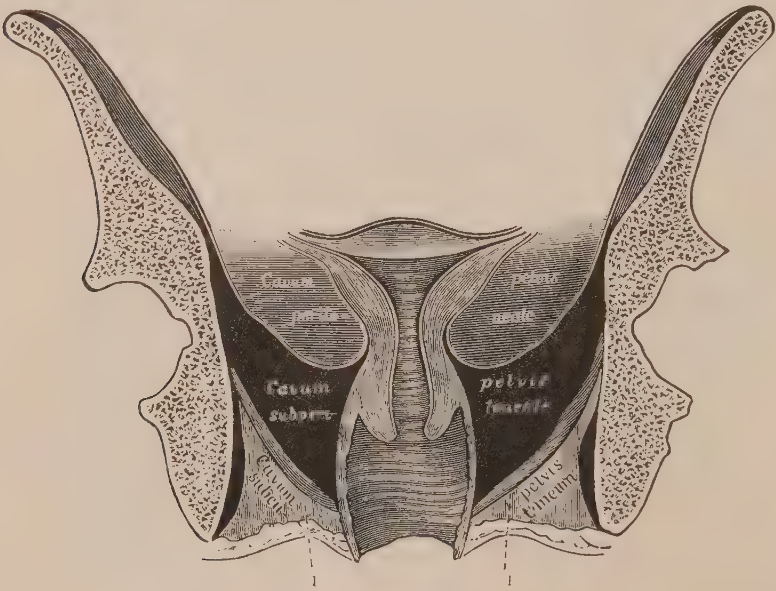


FIG. 36.—Vertical Transverse Section of the Pelvis, Showing Peritoneal Pouches. 1, 1. Levator ani muscle.
(*Luschka.*)

10. Pelvic Connective Tissue. Is a loose cellular tissue, which acts as a padding for the support and safety of the pelvic organs. This structure is continuous with that which exists in other portions of the body. It appears in the pelvis in two varieties: first, as a loose tissue, distributed in an irregular manner around and between organs and between the layers of the broad ligaments, where it acts as a support to the blood-vessels and folds of the peritoneum; second, as firm, well-defined laminæ or planes entering into the formation of the pelvic floor. These have already been described under the name of pelvic fascia. The connective tissue is continued behind the symphysis as the retropubic fat, and lies there in front of the bladder. Between the base of the bladder and the vagina it is connected rather firmly. On the posterior surface of the vagina there is a very loose layer connecting it with the rectum. A large mass is found on each side of the cervix uteri, forming under the broad ligaments what is known as the parametrium, which is united in front and behind by a much thinner layer. Over the body of the uterus the connective tissue is very slight and contains no fat. The rectum and vagina are embedded in considerable masses of this tissue. From the uterus and the parametrium a thin layer extends between the leaflets of the broad ligament, and serves as a support for the vessels. The chief mass of this tissue is situated around the cervix, and extends downward around the vagina to the insertion of the levator ani muscle. The distribution and relation of pelvic connective tissue have been studied in different ways. The most valuable method is by the examination of frozen or spirit-hardened pelves, by which the position of the tissue, its amount, and distribution are recognized. Injections of air, water, and plaster of Paris have been made beneath the pelvic peritoneum in order to determine the lines of cleavage in the pelvic connective tissue and the directions in which pus would be likely to burrow. König made investigations upon the bodies of women who had died from nonpuerperal disease shortly after labor. When an injection is made between the layers of the broad ligament, high up in front of the ovary, it first passes into the tissue at the highest part of the side wall of the true pelvis; then into the iliac fossa, lifting up the peritoneum; follows the course of the psoa, and passes but slightly into the hollow of the iliac bone; finally, it separates the peritoneum from the anterior abdominal wall some little distance above Poupart's ligament, and from the true pelvis below it. Second, when the injection is made beneath the base of the broad ligament and in front of the isthmus, the deep lateral tissue becomes filled first; then the peritoneum is lifted from the anterior part of the cervix uteri. Separation extends to the tissue in the bladder, and ultimately along the round ligament and the inguinal ring, where it separates the peritoneum along the line of Poupart's ligament and enters the iliac fossa. Third, an injection at the posterior part of the base of the broad ligament fills the tissues around Douglas' pouch, and then follows the course as first described.

11. The Vascular Supply. The pelvic organs and peritoneum are supplied through the ovarian, uterine, vaginal, and internal pudic arteries.

The ovarian arteries, analogues of the spermatic in the male, arise from the abdominal aorta just below the renal branches and pass downward over the psoas muscles in front of the ureters, enter the broad ligaments, and pass to the side of the uterus, near which each divides into two branches. The upper supplies the fundus uteri, and the lower anastomoses at the side of the uterus with the anastomotic branch of the uterine artery. In its course the ovarian artery gives off branches to the ampulla of the Fallopian tube and to the isthmus and also numerous branches to the ovary. A small branch is given off to the round ligament. The uterine artery springs from the anterior division of the internal iliac, passes downward and inward toward the cervix uteri, then upward between the layers of the broad ligament in a very tortuous course, and anastomoses with the lower branch of the ovarian. This portion is sometimes called the anastomotic branch, or the puerperal branch, as by its tortuous course it permits the vessel to be straightened out during the enlargement of the uterus in pregnancy. The primary branches given off by the uterine artery are separated from the peritoneum only by a thin layer of muscle-fibers. These give off secondary branches, which penetrate the muscular wall in a direction at right angles to its mucous layer. They anastomose freely and end in capillary loops in the mucous membrane. The vaginal branches spring direct from the anterior trunk of the internal iliac, but sometimes are given off from the uterine or the middle hemorrhoidal. A special branch of the uterine artery to the cervix joins with its fellow of the opposite side to form the circular artery of the cervix, and with the vaginal branches forms the azygos artery of the vagina. Extensive anastomoses take place between

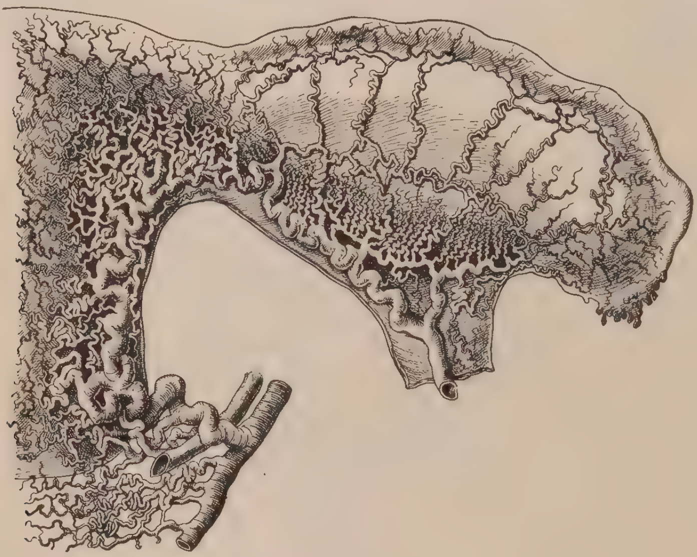


FIG. 37.—Distribution of the Uterine and Ovarian Vessels.

the vessels of the opposite sides. The entrance of the vessels by the broad ligament enables one in extirpation of the uterus to control hemorrhage

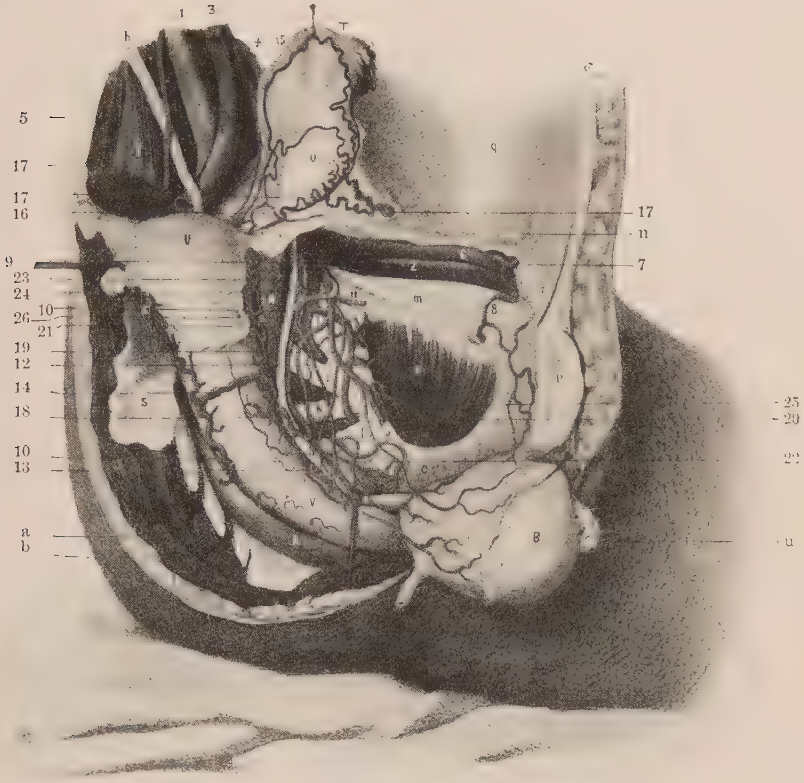


FIG. 38.—Arteries of the Female Pelvic Organs. (*Savage.*)

1. Vena cava inferior, receives right and left common iliac veins. 2. External iliac vein. 3. Abdominal aorta. 4. Inferior mesenteric artery. 5. Right common iliac artery. 6. External iliac artery. 7. Epigastric artery. 8. Obturator branch of epigastric artery. 9. Internal iliac artery crossed in front by h, the ureter. 10. Uterine artery. 11. Obturator artery; its course is along with and below m, the obturator nerve. L. Round ligament. 12. Inferior vesical artery. 13. Vaginal branch from it. 14. Utero-cervical artery. 15. Artery of the Fallopian tube. 18. Vaginal artery 17, 17, 17. Spermatic arteries. 19. Pudic artery. 20. Superior vesical artery. 21. Inferior hemorrhoidal artery, joined at 22, another interior vesical branch. 23. Posterior division of internal iliac artery, terminates in (24) iliolumbar lateral sacral, and (25) gluteal. 26. Sciatic arteries. B. Bladder. u. Urachus. V. Vagina undistended, resting on R, the rectum. O. Ovary. T. Fallopian tube. 15. Fallopian branch. U. Uterus. L. Round ligament. S. Sacral articular surface of sacro-iliac symphysis. P. Pubic symphysis, articular surface. a. Pyriformis muscle. b. Gluteus maximus muscle. c. Obturatococcygeus muscle. p. Spine of the ischium. f. Psoas muscle. g. Linea alba. h, h. Ureters. i, j, k, l. Trunks of sacral nerves resting on the pyriformis muscle. m. Obturator nerve. q. Peritoneum covering the transversalis fascia.

by ligation of the latter. The anterior division of the internal iliac also affords the blood-supply to the bladder and rectum. The perineal region is supplied by branches from the internal pudic artery—a branch of the anterior trunk of the internal iliac. It passes out through the greater sciatic notch and enters through the lesser, passing around the spine of the ischium. In its course it lies upon the internal obturator muscle, and is inclosed with the pudic nerve in a canal formed for it by the obturator fascia. It gives off the following branches: the inferior hemorrhoidal; transverse perineal; superficial perineal or vulvar artery, which is much larger than the corresponding branch in the male—the artery of the bulb; profundi branch to the crus clitoridis; and the dorsal artery of the clitoris. The round ligament receives a small branch from the epigastric artery, which anastomoses with the branch from the ovarian. The *venous distribution* of the pelvis is very abundant, and occurs in the form of numerous plexuses, which communicate freely with one another. These veins are provided with valves. Consequently hemorrhage from an injured part will be very profuse when the whole pelvic vascular system is engorged, as during pregnancy. Dissection discloses a vesical plexus which lies external to the muscular coat of the bladder. At the lower part of the rectum the hemorrhoidal plexus is found situated beneath the mucous membrane. The distribution of the veins of the labia is similar to that of the arteries. From the superficial portion they drain

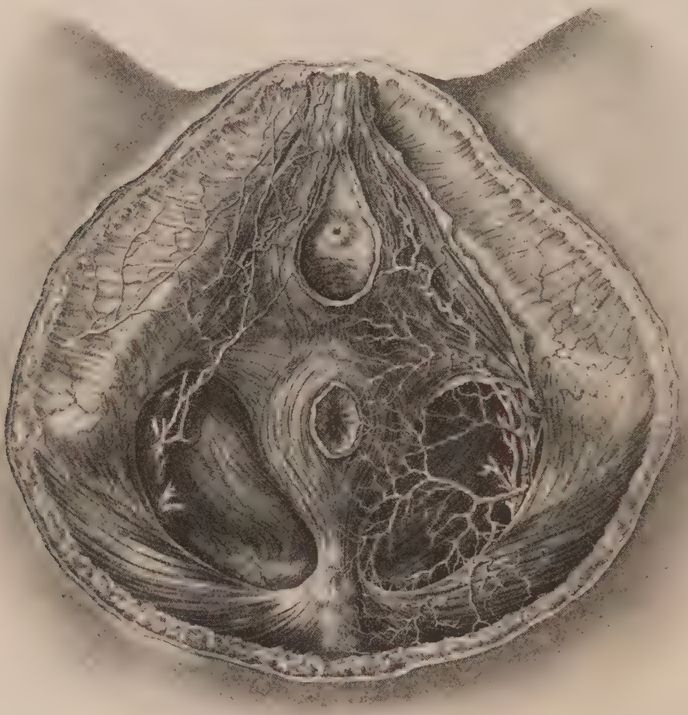


FIG. 39.—Distribution of the Pudic Artery to the Structures of the Perineum. (*Deaver.*)

into the pudic, which communicates with the common iliac vein. The large veins from the labia minora open into the pars intermedia above. The blood returns from the glans and body of the clitoris through the dorsal vein of the clitoris, which communicates with the vesical plexus. The vaginal plexuses are situated, one in the submucous tissue and the other external to the muscular coat. They communicate with the hemorrhoidal and vesical plexuses, receive the blood from the veins of the bulb, and empty into the internal iliac vein. The uterine plexus is very complex, and empties into the ovarian veins. The right ovarian vein enters the inferior vena cava; and the left, the left renal vein. The right ovarian vein has a valve where it pierces the coat of the inferior vena cava, while the left has none. To this arrangement is attributed the greater frequency of pain and disease in the left ovary. The ovarian or pampiniform plexus lies between the folds of the broad ligament and communicate with the uterine plexus. The ovarian plexus opens into the inferior vena cava. At the hilum of the ovary is situated the collection of veins known as the bulb of the ovary. The vesical, hemorrhoidal, and vaginal

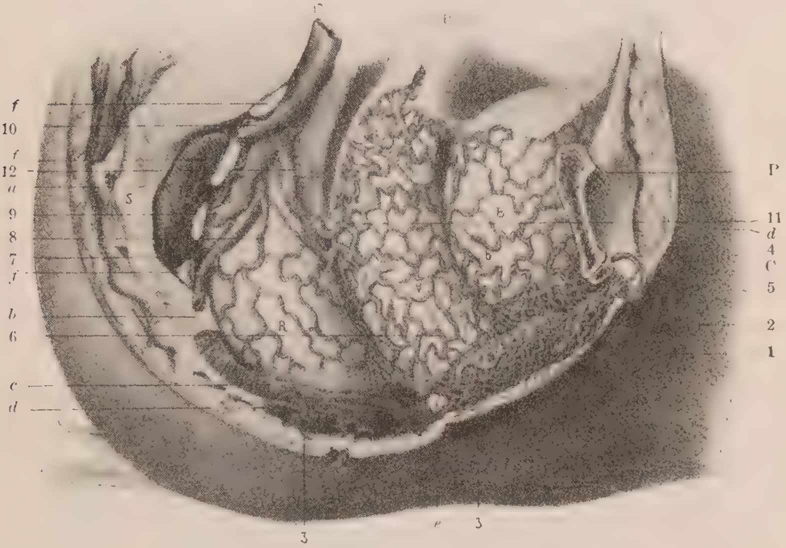


FIG. 40.—Relation tof the Urethral and Vaginal Venous Plexuses to the Veins of the Clitoris and Bulb. The Right Side of the Pelvis Removed by a Section in Front, through the Pubic Body, about an Inch from the Symphysis, and, Behind, through Sacro-iliac Joint. (*Savage.*)

B. Bladder partially inflated, and b ureter cut just before it enters the bladder. V. Vagina distended. P. Section of pubis. R. Rectum. C. Clitoris. S. Sacrum. 1. Bulb. 2. Its urethral venous process. 3. Lower efferent veins. 4. Dorsal vein of the clitoris. 5. Urethral venous plexus. 6. Commencement of vaginal venous plexus. 7,8, 9, 10. Sciatic and gluteal veins corresponding to arteries. 11. Uterine veins assisting to form the uterovaginal venous plexus. 12. Obturator vein. 13. Internal vein. *a.* Pyriformis muscle. *b.* Larger sciatic ligament. *c.* Pubor-, obturatos, and ischio-coccygeal muscles. *d.* Suspensory ligament of the clitoris. e. Bulbovaginal gland. *f, f, f.* Roots of sacral plexus of nerves.

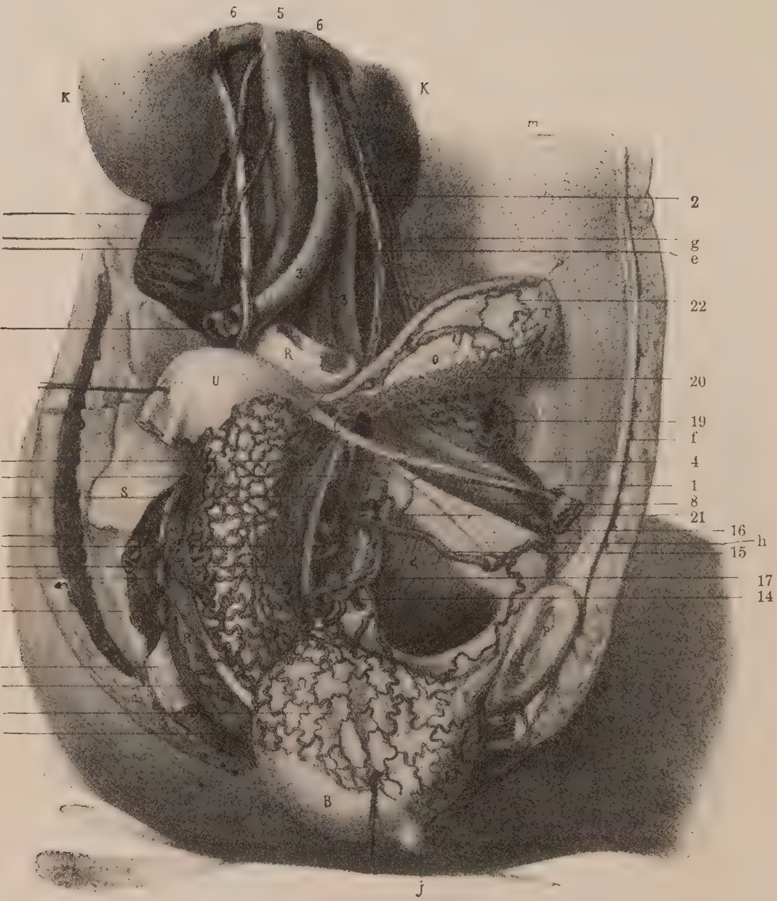


FIG. 41.—Veins and Erectile Venous Plexuses of the Female Pelvis (*Savage.*)

B. Bladder. R. Rectum. L. Round ligament. U. Uterus. O. Ovary. V. Vagina. S. Sacro-iliac articulation. K. Kidney. T. Fallopian tube. P. Pubic symphysis. a. Pyriformis muscle. b. Gluteal muscles. c. Ischiococcygeus muscle. d. Internal obturator muscle. e, e. Psoas muscles. f. Linea Alba. g, g. Uters. h. Obturator nerve. i. Internal inguinal ring, site of canal of Nuck. j. Urachus. k. Sciatic nerve. 1. Abdominal aorta. 2. Inferior mesenteric artery. 3, 3. Common iliac arteries 4. External iliac artery. 5. Vena cava. 6. Renal veins. 7, 7. Common iliac veins. 8. External iliac vein. 9. Internal iliac artery. 10. Gluteal. 11. Iliolumbar. 12. Sciatic. 13. Pudic. 14. Obturator. 15, 16. Epigastric veins. 17. Uterine vein. 18. Vaginovesical venous rete. 19. Spermatic veins. 20. Bulb of the ovary. 21. Vein to round ligament. 22. Fallopian veins.

plexuses, with the pudic veins, empty into the internal iliac vein, which joins the inferior vena cava. From the hemorrhoidal plexus there is a communication with the portal system through the superior hemorrhoidal vein.

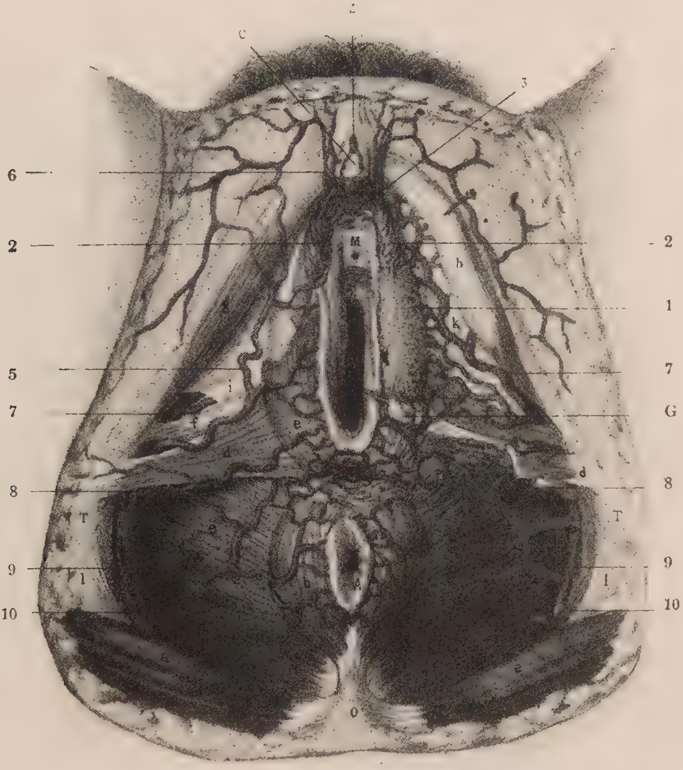


FIG. 42.—Erectile Organs and Veins of the Female Perineum. (*Savage.*)

h, g. Crura clitordis. 1, 2. Bulb of the vagina. 3. Vestibular intercommunicating branches. 4. Veins of the clitoris. 5. Superficial perineal and obturator veins. 6. Veins of communication with superficial epigastric veins. 7. Labial branches of pudic. 8, 9. 10. Pudic vein and primary branches. M. Urethral orifice or meatus. V. Vaginal aperture. A. Anus. T. Tuberosity of ischium. O. Coccyx. G. Vulvovaginal gland.

12. **The lymphatic system** comprises: first, the lymphatic glands; second, the lymphatic vessels. The lymphatic *glands* are: the inguinal glands, which lie parallel to and just below Poupart's ligament; and the pelvic glands. (Fig. 43.) These comprise: (*a*) a gland situated at the isthmus uteri; (*b*) the hypogastric or iliac glands, which lie beneath the peritoneum, in the space between the internal and external iliac vessels; (*c*) the sacral glands, situated on the lateral aspect of the anterior surface of the sacrum and the mesorectum; and (*d*) a gland or small collection of glands at the obturator foramen, known as the obturator gland of Guerin. All discharge into the lumbar glands, which lie in front of the

lumbar vertebræ, and finally into the thoracic duct. The lymphatics of the external genitals form an extensive network on the internal aspect of the labia majora, over the labia minora, around the vaginal and urethral orifices, the vestibule, and the clitoris. All discharge into the inguinal glands. As a consequence, syphilis or cancer affecting the vulva or lower fourth of the vagina causes involvement of these glands. In the upper three-fourths of the vagina and cervix uteri the lymphatics open into the hypogastric glands. This is true not only of the lymphatics of the upper three-fourths of the vagina and cervix, but also of the lymphatics of the bladder. The lymphatics of the uterus pass through the broad ligaments with those of the ovary and tube and enter the lumbar glands. Some of

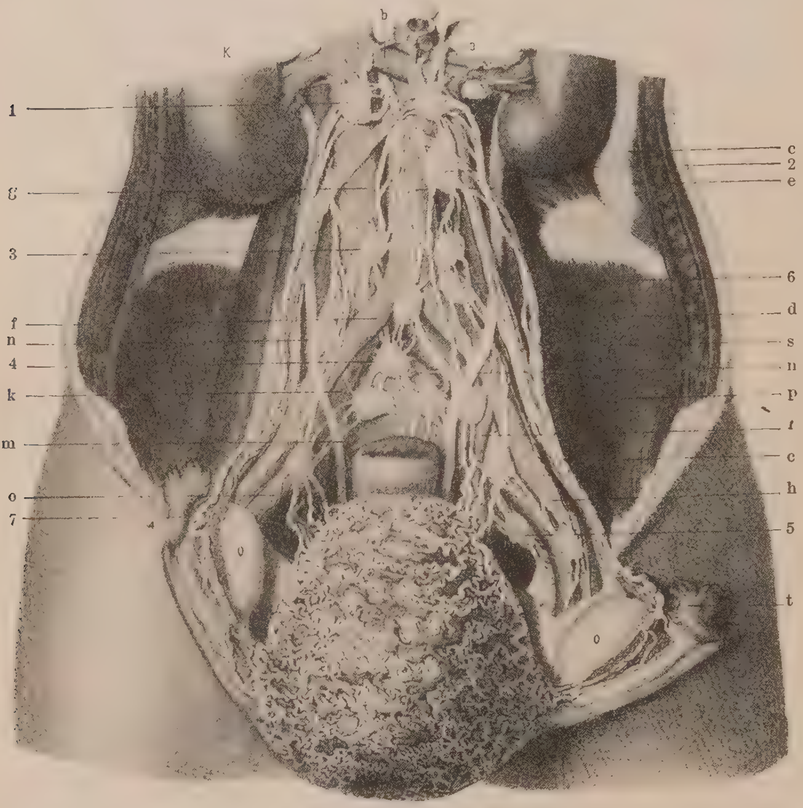


FIG. 43.—The Lumbo-iliac Lymphatics and Glands. Lymphatics of the Gravid Uterus and Appendages. (*Savage.*)

1, 2. Superior lumbar glands. 3. Inferior lumbar glands. 4. Sacral lymphatic glands. 5. External and internal lymphatic glands. 6. Common iliac glands. 5, 7. Spermatic lymphatic plexus. a. Left renal vessels. b. Left renal vein. c. Left spermatic vein. d. Left spermatic vessels, covered by their lymphatic plexus. e. Aorta. f. Common iliac trunks. g. Ascending cava. h. External iliac artery and vein. m, n. Ureters. o. Right common iliac vein. p. Iliacus muscle. s. Psoas muscle. O. Ovary reversed, showing lymphatics between it and its bulb.

the uterine lymphatics pass along the round ligaments to the glands of the groin. Leopold, in investigating the lymphatics in the unimpregnated uterus, regards the mucous membrane of the organ as a lymphatic

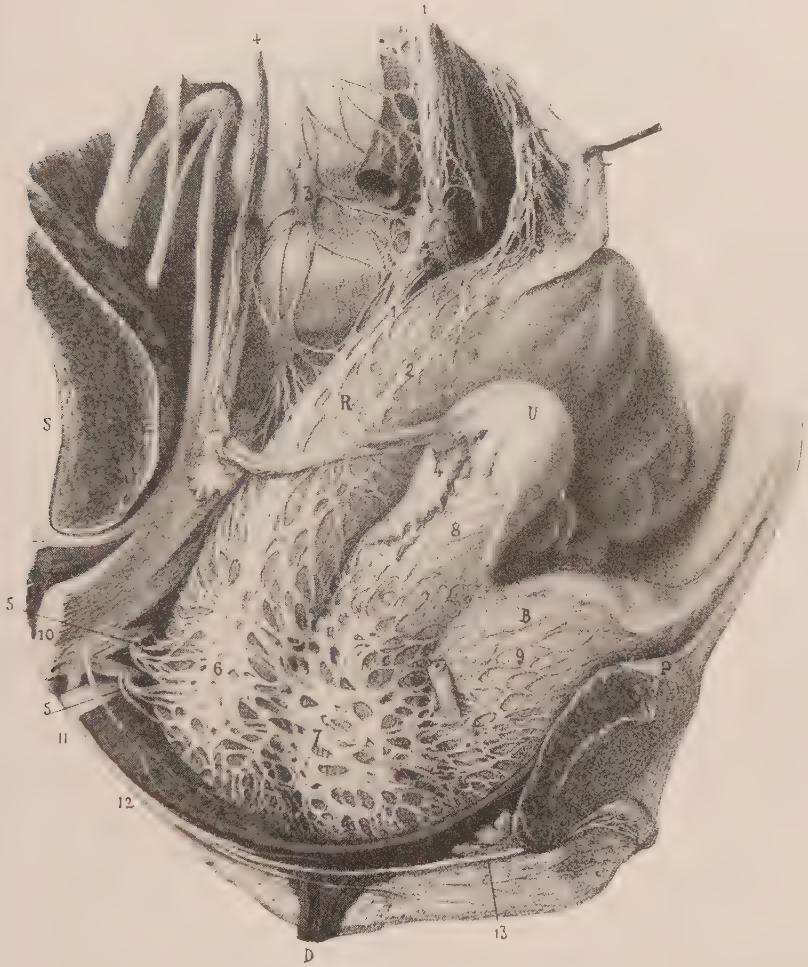


FIG. 44.—Nerves of the Unimpregnated Uterus with the Nerves of the Clitoris. (*Savage.*)
1. Hypogastric plexus. 2. Rectal branch of inferior mesenteric plexus. 3. A lumbar ganglion of the sympathetic. 4. Spermatic plexus, supplies Fallopian tube, ovary, and part of the uterus. 5. Branches from third and fourth sacral, aiding to form 6, 7, right inferior hygogastric plexus. 8. Uterine filaments. 9. Vesical plexus and branch. 10. Trunk of great sacrosciatic nerve. 11. Muscular branch of the fourth sacral nerve. 12. Trunk of pudic nerve. 13. Continuation of 12 into dorsal nerve of the clitoris. R. Rectum. U. Uterus. B. Bladder. D. Transversus perinei muscle cut across. S. Section of ilium. P. Section of symphysis.

surface consisting of lymph-sinuses covered with endothelium. The lymph passes from these spaces into the *vessels* of the muscular coat, and flows into the larger vessels which enter the broad ligaments. The distribution of these vessels and their extensive character account for the rapidity with which septic matter is absorbed from the uterine cavity and explain the various routes by which bacteria can pass through lymphatic canals or penetrate the blood-vessels.

The lymphatics of the rectum lie in the mucous and muscular layers and communicate with the glands of the mesorectum or the sacral glands.

The nerves distributed to the pelvic organs are derived from the spinal and sympathetic systems. The branches from the spinal nerves consist of the inferior hemorrhoidal branch of the pudic, from the fourth and fifth sacral, and of the coccygeal nerves. These supply the levator ani, sphincter, and coccygeus muscles; the muscles of the perineum and clitoris are supplied by branches from the internal pudic, which nerve terminates in the nervous plexus of the glans clitoris. (Fig. 44.) The hypogastric plexus, derived from the sympathetic, lies between the common iliac arteries, and distributes branches, which are reinforced by others from the lumbar and sacral ganglia and sacral nerves, to form the inferior hypogastric plexuses, one of which is situated on each side of the vagina. These plexuses distribute filaments to the vagina, uterus, Fallopian tube, and ovary. The pelvic, splanchnic, and hypogastric nerves are motor and sensory to the bladder; the pudic is motor to the sphincter; and all the nerves of the vagina and clitoris are sensory to the skin of the perineum, and especially so to the mucous membrane of the glans clitoris. The terminal filaments in the uterus are found in the nuclei of the unstriped muscle. Those of the mucous membrane are said to end in the ganglia. End-bulbs have been found in the clitoris and vagina. In the ovary the nerves pass to the Graafian follicle and to the walls of the membrana granulosa.

13. Consideration of the Pelvic Organs and Structure Studied as a Whole. In the upright position the plane of the brim of the pelvis is at an angle of 60 degrees to the horizon. The fundus of the uterus lies just below this plane, with its axis at right angles to it, and consequently at right angles to the vagina, which is parallel to the brim of the pelvis. In the upright position the internal abdominal pressure is directed against the symphysis and the posterior surface of the fundus of the uterus when in its normal situation.

The uterus, as we have seen, is freely movable—swung in its position in the pelvis by the ligaments. The broad ligaments support it in the center of the pelvis, and by their position and relation serve to assist in maintaining it in an anteflexed position. The round ligaments are an additional stay, and, when of normal resiliency, draw the fundus forward. The other ligaments are the uterovescial and the uterosacral. The former consist of a continuation of the peritoneum from the bladder to the uterus; the latter of folds of peritoneum which also contain muscle fibers derived from the superior muscular layer of the uterus. The function of these filaments is to hold back the cervix while the intra-abdominal pressure maintains the fundus forward. Increase in the weight of the uterus; increased intra-abdominal pressure and deviations from the normal inclination of the pelvis; for the proper resiliency and tone of the ligaments; and from the natural relations and support of the vagina, are all factors in the production of uterine displacements, especially in that form characterized by descent. The plane of the pelvic outlet when the patient is erect forms, in front, an acute angle with the horizon. The urethra, the vagina, and in the upper part of its course, the rectum, are parallel to the plane of the brim of the pelvis. The lower portion of the rectum turns acutely backward and forms an axis at right angles to that of the vagina. This portion, the anus, looks backward and downward; consequently the introduction of the finger or nozzle of a syringe must be directed forward and upward, or directly toward the vagina, and after passing into the anus is carried upward and backward. On median vertical section the vagina will be seen as a mere slit, slightly **S**-shaped, the lower part of its posterior wall presenting a convex surface anteriorly. Consequently, the pelvic floor is divided into two segments, the anterior and upper of which rests on the more fixed posterior segment. The rectum at the anus forms an anteroposterior slit.

Intra-abdominal force first causes pressure of the anterior segment against the posterior, and then a sliding backward of that portion of the inferior segment in front of the anterior wall of the rectum.

PHYSIOLOGY.

14. **Function.** The important functions of the genital organs are the processes associated with reproduction. These comprise alterations in the organs by which menstruation is established, repeated monthly, and finally discontinued; the relation of the sexes in copulation; the fecundation of the ovum, its subsequent nutrition, and the procedure by which the matured product attains a separate existence.

The transition from child to woman, indicated by the appearance of menstruation, is denominated *puberty*.

The completion of development, which fits the individual for the processes of maternity, is called *nubility*.

The deposit of the vitalizing principle of the male within the body of the female occurs through the act of *copulation*, and its union with the ovum, resulting in the establishment of a new life, is known as fecundation.

The nutrition of this vitalized structure and its subsequent course of development are recognized as *gestation*.

The processes by which the matured product secures a separate existence are known as *parturition*.

The first three of these functions and their variations from the normal comprise the field of gynecology.

15. **Puberty.** The completion of the developmental process that results in the establishment of menstruation and ovulation has been called *puberty*. It marks the transition from the child to the woman, and occurs between the thirteenth and fifteenth years. The age of the individual differs under varying circumstances. Puberty occurs earlier in the natives of hot climates than in those of the north, and earlier in the Latin races than in the Anglo-Saxon. City girls mature at an earlier age than those raised in the country, and those raised in affluence sooner

than the poor. The occurrence of the phenomena of menstruation prior to the age of thirteen is called *precocious puberty.* Such instances are not infrequent. Isolated cases in which puberty is manifested at a very early age. Rein reports a girl of six years whose pubis was covered with hair. She menstruated regularly for a year. The New York Medical Record, 16, xi, 1895, reports a girl who, when ten years of age, gave birth to a child.

Retarded or delayed puberty is caused by chlorosis, general ill health, plethora, or some congenital deformity of the genital tract. Numerous instances are recorded where women have given birth to children prior to the establishment of menstruation. In other words, ovulation may occur without being followed by menstruation.

The advent of puberty is manifested by the following characteristics in addition to menstruation: the figure becomes more rounded, from an increase of adipose tissue; the breasts enlarge and frequently become painful; hair grows upon the mons veneris and labia majora; there is an increase in the quantity of blood; development of the glandular structure, particularly in the uterus and the mammary gland; and marked changes in the nervous system. According to Christopher Martin, "there is a remarkable transformation in the psychic, emotional and mental life of the girl. The current of her thoughts is mysteriously changed. Hopes and yearnings before unknown thrill and agitate her, and life acquires a new and deeper meaning. These profound and subtle changes are not so difficult to understand if we accept the view that puberty means the sudden bursting into activity in the midst of the nervous system of a hitherto dormant center."

The glandular development of the mammæ may be rapid at times so rapid as to simulate a tumor. The age of the individual should prevent error in diagnosis.

16. Nubility. The advent of puberty indicates that the conditions and functions are established that will permit procreation, but the structures are not sufficiently developed to render the individual suited for favorable reproduction. Experience has demonstrated that the mortality is much greater among those who come to the completion of gestation prior to the age of twenty. Women coming to early maternity mature early, reach the menopause at an early age, and are prematurely aged.

17. Menstruation and Ovulation. Menstruation—also called the menses, the monthlies, the courses, the turns, the sickness, and the periods—has been defined by Sutton as the "periodic discharge of blood from the uterus, accompanied by the shedding of the epithelium of the body and fundus, as well as of that lining the utricular glands near their orifices."

Ovulation is the discharge of an ovum from a matured Graafian follicle. These two processes are considered here as having a direct relation, though we have no positive proof that the one may not occur without the other. Indeed there is determinative evidence that occasionally they are independent. The frequent occurrence of pregnancy prior to the advent of puberty and subsequent to the climacteric is an indication that ovulation can occur without menstruation.

TON MEDIC

The investigations of Fränkel and others justify the following theory regarding the corpus luteum and its influence on the menstrual function.

1. The corpus luteum is a gland with an internal secretion. Following each ovulation, this gland is redeveloped in the functionating ovary and its secretion dominates the occurrence of menstruation.

2. The secretion of the corpus luteum entering the blood determines the nutrition of the uterus, especially that of its endometrium, in whose connective tissue it excites extreme hyperplasia and hyperemia.

3. It prepares the uterus for the reception, retention and nutrition of the fecundated ovum, and where fecundation has not taken place, establishes the menstrual flow. The acceptance of the above hypothesis gives an intelligent explanation of the periodical occurrence of menstruation and its variations. Menstruation, in the majority of women, occurs every twenty-eight days. The intervals may vary from twenty-one days to five or six weeks. It does not occur at an absolutely definite date in the same individual.

The quantity of blood lost is difficult to determine. The average amount is estimated to be three to five ounces. The duration of the flow varies, but less than two, or more than eight days indicates an abnormal condition. Absent, or greatly decreased flow is known as amenorrhea. The prolonged or excessive flow is called menorrhagia. When the function is associated with severe pain, it is dysmenorrhea. The menstrual discharge is not pure blood, but consists of a dark bloody fluid, thin and slimy in character, which contains, as revealed by the microscope, blood-corpuscles, leukocytes, epithelium, and stroma. The normal menstruation is not clotted, due to the admixture of the secretion of the uterine and cervical glands. It is only when the flow is excessive or the gland secretion deficient that clots are present.

Menstruation occurs only in women and in certain monkeys; it is apparently limited to those animals that maintain the erect position.

Menstruation involves between thirty and thirty-five years of the life of woman. This is known as the period of active sexual life, beginning from the thirteenth to the fifteenth years and continuing from the forty-fifth to the fiftieth. The final cessation, like its advent, may be advanced or retarded by various causes. Each menstrual period is generally preceded by some premonitory symptoms, a sense of weight, pressure, or uneasiness extending down the limbs, a sense of exhilaration, an increased vascular tension, and, Belfield asserts, an increase of weight which may exceed one pound an hour for several hours, the women gaining seven to nine pounds in twenty-hours. This increment, he says, is due: 1, to increased absorption of oxygen; and, 2, to decreased elimination. With the establishment of the flow she suffers from depression, languor, malaise, disinclination for exertion (either physical or mental), and, according to Belfield, decrease in weight. Many women will exhibit a tendency to the occurrence of gastro-intestinal disturbance, or the formation of toxins developing an autointoxication, which will produce migraine, aggravate nervous manifestations, chorea, epilepsy, and even delusions. Epilepsy and insanity are frequently so marked and recur so regularly with the menstruation as to lead the family and physician to believe the disorders are the result of diseased conditions of the pelvic organs.

During the menstrual process the uterus and pelvic viscera become engorged with blood; the uterus is enlarged, turgid, and sensitive; during the process of engorgement the glands become filled with epithelium discharged from the external portion of the gland. Many of the cells are liquefied, increasing the quantity of mucus. With the establishment of the flow the engorgement is relieved and the general disturbance subsides. It is probable that these manifestations are due to the disturbed balance between the internal secretion of the ovary and those of the other ductless glands. Following the period, the mucous surfaces are gradually regenerated from the epithelial tissue remaining in the glands, until, at its completion, the structure is again renewed. The blood escapes from the capillaries by diapedesis, in places raises the epithelium, in others fractures it, so that its loss is much greater during the flow. The menstrual flow is synchronous with the maximum activity of the gland known as the corpus luteum, and follows ovulation some two weeks. Should the ovum become fecundated, menstruation in the majority of cases fails to occur. The menstrual discharge comes from the entire cylindric epithelium-lined mucous membrane. My own researches, confirmed by those of many others, are sufficient to demonstrate that the Fallopian tubes as well as the uterus take part in the menstrual flow. It is not unreasonable to suppose that the presence of bloody fluid in the

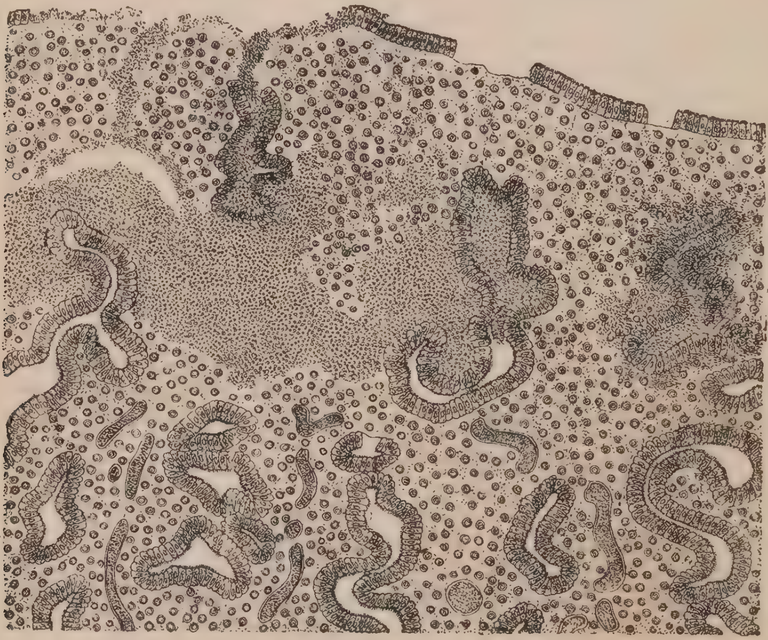


FIG. 45.—Changes of Uterine Mucous Membrane During Menstruation. (*Wider.*)

tube is of value in promoting the nutrition of the fecundated ovum and that the consequent distention of the tube facilitates the passage of the ovum to the uterus.

The theory of the determination of menstruation by an internal secretion formed by the corpus luteum seems justified by the following phenomena:

1. The ovary furnishes the ovum. It is the function of the uterus to retain and nourish the ovum until its product is ready for a separate existence. Hence, the producer rather than the retainer should dominate the function.

2. The entire removal of ovarian structure invariably results in the cessation of menstruation.

3. Removal of the ovaries is generally followed a few days later by the occurrence of a vaginal discharge which cannot be distinguished from the ordinary menstruation.

4. Strassman's experiments of injecting the structure of the ovary with sterilized water were followed two days later by a discharge from the uterus which in every way resembled menstruation.

5. The destruction of the corpus luteum is followed by lapse of the subsequent menstrual period.

The occasional occurrence of a bloody discharge after the removal of both ovaries has been held to negative our second proposition, but my experience leads me to doubt the regular recurrence of menstruation after the removal of both ovaries. An occasional bloody discharge from the genital tract after the extirpation of both ovaries means nothing more than the relief of some local congestion.

It is only when the ovaries and utricular glands attain a development that renders their secretion capable of exerting a dominating influence that puberty occurs, and the process continues until these structures begin to atrophy and cease to exert their governing course. Napier denies the probability of the period being produced by ovulation and cites, as presumptive evidence, the occurrence of the latter without menstruation and the continuation of menstruation after the removal of both ovaries. Many other theories are advanced for the periodic occurrence of menstruation. Johnstone believed in a special menstrual nerve plexus, situated near the cornua of the uterus; but this structure has not been recognized by any other observer.

Menstruation continues during pregnancy only as the rarest exception, and the functional activities of the ovaries is suspended during lactation. Neither ovulation nor menstruation is likely to occur during lactation. Many women prolong the period of lactation for the purpose of rendering themselves less susceptible to fruitful coition.

18. The menopause, or the conclusion of menstrual activity, is regarded as a critical period in woman's existence. It is variously denominated as the menopause, the climacteric, and the change of life. The menstrual life of woman lasts, upon an average, nearly thirty-five years, so that the menopause should occur between the forty-seventh and fiftieth years. Its occurrence may be accelerated or retarded by various causes.

The term menopause is employed to designate the period of the change. The average duration of the menopause is about two and one-half years. A few fortunate persons continue to menstruate regularly until a certain period, when the flow discontinues, never again to recur. Others continue irregular for six months, when it ceases. Generally a patient will notice that the periods are getting more scant, until finally she misses one or two periods; then menstruation recurs for a while, to subside again, thus continuing irregularly for one of two years. The irregularity may be prolonged over a period of four or five years. While, as a rule, the intervals are longer, the periods may occur more frequently, with intervals of but twenty-one or even fourteen days.

The flow may be increased, and occasionally hemorrhages occur without any assignable cause.

Excessive or prolonged bleeding should always be a cause of anxiety, and should lead to a careful examination in order to determine its cause. The cause should not be assigned to change of life until careful investigation has eliminated every other source. The occurrence of menstruation is attended with the elimination of certain materials from the blood.

Chemic changes in the blood and tissues are constant, and the elimination of the albuminoids during menstruation is demonstrated by a more marked alteration of the blood following menstruation than the mere blood-loss would produce.

Premature menopause occurs prior to the age of thirty-two years. It may be induced by shock, severe illness, prolonged anxiety, overstudy, mental affections, disease of the ovaries (such as destruction of the ovarian stroma by double ovarian tumors), sepsis, chronic disease of the appendages, and some forms of metritis. A rapid increase in adipose tissue is associated with some cases.

Early menopause occurs between the ages of thirty-two and forty-two years. It occurs early in the virgin, and earlier in blonds than in brunettes. Fat women reach the menopause early. Occasionally the menopause occurs at an early age without any assignable cause.

Retarded or Delayed Menopause. The occurrence of the menopause is distinctly affected by heredity. It may be delayed by child-bearing, uterine growths, or malignant degeneration. Robertson reports the case of a woman who ceased to menstruate for twelve months at the age of fifty years, when the flow returned and continued until her death at seventy. Saxonia speaks of a nun who had a return of her menstruation at the age of one hundred years, which continued regularly until she died three years later.

When menstruation is arrested by anemia or pregnancy, we see in the skin marked deposits of pigment and other materials that would be eliminated by its occurrence.

When the menopause occurs suddenly (either as a result of the retained products or a want of balance in the action of the internal secretion from the ductless glands) an intoxication follows which causes various nervous perversions. Peculiar vasomotor disturbances are very usual, such as sudden sensations of heat; flushings; waves of blood rolling up to the face, accompanied by a sensation of giddiness, suffocation, or oppression; cold, clammy perspiration; shooting neuralgic pain; headaches; fullness of the vessels of the head and neck; palpitations; gastric irritation; diarrhea; irritability of temper; melancholia; and disturbed mental balance.

In sudden production of the climacteric after radical operations the vasomotor disturbances are frequently so distressing as to render the condition for which the operation was performed preferable.

19. **Copulation** is that act of union by which the vitalizing principle of the male is deposited in the genital organs of the female. The sexual desire of woman is much less marked than that of man. Frequently she has no sexual sensation, the act is even repugnant, but she yields to the man's embrace from her wish to gratify his desire. Such a woman, mated to a man of impetuous inclination, often becomes a sexual slave. The clitoris and the tissues about the vestibule are erectile, and take part in the orgasm, during which a secretion is ejected from the vulvovaginal glands.

Imperfect or unsatisfactory copulation is a prolific source of disease. Efforts to avoid the legitimate results of copulation, like all violations of nature's laws, visit their penalty upon both the offenders, but most heavily upon the woman.

20. **Fecundation** is the union of the spermatozoid with the ovum and the successful fertilization of the latter. Its occurrence does not require that the woman should share in the pleasurable sensation of copulation; indeed, it can follow in spite of the fiercest resistance upon her part. The spermatozoids, the active fertilizing agents from the man, require no assistance from the woman, but by a vermicular motion can make their way to the ovum in the internal organs.

There has been much discussion over the probable point at which fertilization occurs and as to the ability of the spermatozoa to penetrate the narrow isthmus of the Fallopian tube against the waving cilia, the function of which is to promote a current toward the uterus. The demonstration that they overcome these obstacles in the sheep and other lower animals, and are found swarming over the ovary, and the frequent occurrence of ectopic gestation in the woman, should be accepted as a sufficient demonstration that they make the voyage. It is most probable that fecundation results in the tube, from which the vitalized ovum passes into the uterus, which is prepared for its reception.

Impregnation is more likely to occur during or immediately following menstruation; less likely, immediately preceding the flow; and the woman is least susceptible in the mid-interval.

Independent of organic conditions, there is a marked difference between individuals as regards their susceptibility to impregnation.

ETIOLOGY.

21. **The Importance of Etiology.** A knowledge of the causes which produce disorders of the genital tract is essential to the ready recog-

nition of their character and employment of proper measures for the relief of the suffering victim. The study of the forces which combine for the production of genital disorders is especially complex. Not only do they comprise the actions of the diseased, but also of those with whom she is associated—particularly those who have been her progenitors. Here, truly, we see the sins of the parent visited upon the children beyond the third, to many generations.

22. Classification. The causes of diseases are sometimes divided into two great classes, the predisposing and the exciting. When considering some particular class of disease, as, for instance, inflammation, such classification can be arranged readily, but when we come to consider all the disorders to which the genital organs are subjected, it becomes more difficult to declare which are predisposing and which are exciting. In one individual the diseased state can be traced directly to abnormalities in development; in another to defects in her manner of life; the third may have had the disease brought to her through her sexual life; while a fourth suffers from injuries incident to reproduction.

The following classification seems comprehensive:

a. Hereditary and congenital;
b. Hygienic;
c. Sexual;
d. Traumatic;
e. Infective;
f. Incidental to age.

a. *Hereditary and Congenital Causes.* It seem impossible, although demonstrated day by day, that the atoms, supplied by the male and female, which unite to organize processes of construction for a new life, contain within their minute compass the impetus which is to lead to the development of traits and characteristics similar to those possessed by their progenitors.

These involve not only shade, form, and color, but mental and moral attributes. Imperfections and unfortunate traits which are common to the parents are intensified in the offspring. A knowledge of such transmission is employed by the stock raiser to improve his herds. Only such males are employed as will improve and correct the recognized defects of his herd. While it is impossible to introduce the precision of the stock breeder in the relation of the sexes of the human race, it cannot be denied that the production of healthy offspring is too rarely the motive for union. Family, position, and wealth are more frequently considered essential than are good health and good morals upon the part of the elected husband. The worn out roué, the debauched or decrepit son of wealth is preferred to the virile young man who has his fortune to make. A feeble or sexually exhausted male united to a cold, dispassionate woman with little or no inclination to maternity must result in the production of offspring with still lower sexual virility. Sterility, defective sexual and physical development, and lessened powers of resistance are likely to characterize the offspring of such a union. Intemperance in eating and drinking, overwork, exhaustion from indulgence in the exigencies of fashionable life, and a tendency to marked fat production in one or both parents, lessens virility and vitality in the children. Intensification of pre-existing traits, the occurrence of vicious tendencies, lessened resistance to certain constitutional diseases as tuberculosis, the gouty diathesis, and malignant degenerations may be transmitted from parent to child and are known as hereditary causes of disease. Not infrequently as a result of careful hygiene, improved environment, and other favorable conditions such tendencies may not make their appearance in one or more generations and apparently become intensified in one less favorably situated. The most marked influence upon the sexual life of the individual will be recognized in the study of the development of the ovum. During its progress of development the ovum is subjected to various disorders which may lead to arrest or deranged formation of the structures of the genital tract, dependent, of course, upon the period or stage of development in which this may take place. Should the change occur before the separation of the Müllerian ducts and the genital bodies from the Wolffian, there may be an absence of the structure upon the side affected, so that kidney, ovary, tube, and one horn of the uterus are wanting. (See Malformations.) In the latter stages of development one or both Müllerian ducts may be affected, resulting in absent, rudimentary or defective uteri. The ducts may fail to coalesce; form apparently well developed uteri and vagina, with a septum between; or the coalescence may be partial. Failure to coalesce causes the development of separate and generally rudimentary uteri and vagina. Partial coalescence may involve only the vaginal portion of the tubes, with the two horns of the uterus completely separated, making a double uterus, or it may be a bicornate uterus joined together with a common neck; or the division may be in the fundus of the uterus only. In the development of the tubes, the inflammatory process, which results in the arrest of development, may affect one tube only, while the other goes on to full development. The rudimentary duct may encircle to some degree the well developed organ. Such a condition may result in the development of a uterus which is unequal to the proper performance of its functions and endanger the life of the woman in a subsequent gestation; or the horn may be so well developed as to carry on its functions without the abnormality being suspected until some operative procedure discloses the actual condition. The rudimentary horn may in some cases be associated with an atresia of the corresponding vagina. Such a condition would not attract attention until puberty, when fluid unable to escape would accumulate in the defective tube, forming a more or less definite tumor. Such a tumor may be situated to one side of the vagina, but more frequently points somewhat anterior to the well formed canal. A woman who had given birth to two children came under my observation, and had at that time a large interstitial fibroid growth in the uterus. Examination revealed, anterior to and to the right of the vagina, a pouch whose character was not recognized until the operation when it was found to be the blind pouch of a rudimentary uterus. The septa which occasionally divide the vagina produce no appreciable effect during virginity and are not likely to be discovered until after the marriage of the individual. A septum produces so small a tube as to lead to discomfort and pain during the marital relations and to obstruction during parturition. Of course, in the latter, the amount of obstruction will depend upon the thickness and firmness of the septum. Generally it is torn through the greater part of its extent during parturition. Occasionally, subsequent to parturition, a bridle or remnant of this septum will be found connecting the anterior and posterior wall of the vagina, the remaining portion of it having either been torn through or sloughed away as a result of parturition. Defective development may involve the lower part of the genital tube, the vagina and vulva. Thus, there may be an absence of the urethra, a condition of hypospadias, in which the urethra opens into the vagina. A portion of the vagina may have undergone atresia or the vulvar orifice of the vagina be closed by an imperforate hymen. These conditions are not likely to produce symptoms until the woman has reached and passed the period of puberty, when the occurrence of the menstrual molimina without the presence of a discharge indicates something abnormal. If the condition is not recognized a tumor will ultimately develop from retention of the menstrual discharge. Deformities may affect the labia majora and the labia minora, the former being thin; there may be a slight amount of fatty tissue; or the inguinal canal may remain large, permitting the secretion from the peritoneal cavity to descend into a sac, forming a hydrocele; or the intestine may push down causing hernia. The labia minora may be elongated or almost absent. The clitoris may be defective in its development, or so large and hypertrophied as to lead to doubt as to the sex. This malformation may affect the genital organs of either sex, giving rise to uncertainty as to the sex of the individual under consideration, when it is known as hermaphroditism. True hemaphroditism, the presence of both organs in the same individual, probably does not exist. Pseudohermaphroditism, or a condition in which the organs of one resemble those of the other sex, are quite frequent. Malformations of this character, which have occurred during the progress of the development of the ovum, are known as congenital conditions in contradistinction to those we have been considering as hereditary.

b. *Hygienic Causes*. Woman is like a flower. To reach the highest development she must absorb generously the rays of the sun and drink deeply of pure air. Unfortunately, the tendencies of civilization have been to deprive her of these essentials at the period of life when she is in most need as she enters into womanhood. Her male companions, with whom until this time she has enjoyed almost equal freedom, are still permitted to enjoy the freedom of nature, while she is condemned to interest herself with indoor pursuits. No longer allowed to romp and play she is doomed to practise being a lady. Stiffly and often tightly dressed, she is compelled to assume the attitude and thoughts of a mature woman, and what exercise she secures is taken so sedately as to be unworthy of that designation. At the period of life when the development of her sexual functions are making the greatest draft upon her nervous system, she is confined closely to her books and music, securing the accomplish-ments and embellishments which are to be her capital. At an early age she is introduced to society, and if fortunately (?) situated her life becomes a continuous whirl of parties and entertainments entailing late hours, irregular meals, undue exposure, excitement, and a continual appeal to the emotions. Her social position demands that the natural contour of the body be distorted by tight dresses, which displace the viscera from their normal relations, increasing intra-abdominal pressure, and driving the pelvic organs to a lower level. The circulation in these organs is necessarily influenced by the interference with the venous return, thus causing stasis. The compression of the lower part of the chest interferes with the expansion of the lungs, with the action of the stomach, heart, and liver, so that the processes of nutrition are affected, and the individual suffers from anemia, neurasthenia, defective action of the digestive tract, and disturbances of the functions of the genital organs. The faults enumerated are still further enhanced by enveloping the central portion of the body with skirts supported from the waist, while the extremities are clad in network hose and thin shoes or slippers, and the neck, chest, and arms bare. Ordinarily she will go fairly clad and make the above changes in the coldest weather; occupying crowded rooms, subject to drafts—this regardless of the menstrual periods. Should it be surprising that serious pelvic disorders are frequent and pelvic disease is the rule rather than the exception? The usual life of the young woman precludes regularity in the performance of her functions. The evacuation of her bowels and bladder are neglected. Retention of the contents of these viscera produce repeated displacements of the uterus which finally become permanent. The failure to evacuate the bowels causes a toxemia which profoundly influences nutrition and produces toxic symptoms, in which the pelvic organs have a considerable part.

Want of general cleanliness necessarily has a marked influence upon the health and nutrition of the individual. The skin takes a very active part in the processes of elimination and must be kept in good condition by proper and systematic bathing to do effective work. Neglect of local cleanliness results in the decomposition of the accumulating secretions from the vaginal tract and the sweat and sebaceous glands of the vulva, which are to some degree soiled with urine. Such an accumulation forms an excellent culture fluid for micro-organisms and diseases of the vulva and vagina are thus produced. The retention of the smegma beneath the prepuce of the clitoris leads to irritation and adhesions between it and the glans, to irritation of the bladder, frequent micturition, wetting of the bed, to nervous disorders, sometimes convulsions, and frequently to masturbation.

c. *Sexual Causes.* With the development of puberty the sexual instinct dominates the female organism. Her viewpoint of life changes. However exalted her ambition to attain eminence in some unusual line the impetus to maternity cannot be extinguished. Less passionate, less lustful than man, she yet clings with greater constancy and devotion to the companion of her choice. Her more limited sphere of action in life; her more delicately organized nervous system, renders her especially susceptible to the influence of the emotions. While the sexual desire or eroticism varies in individuals, the majority of women yield to the sexual relation through a desire to please the man rather than from any sexual inclination, from a desire to gratify rather than to be gratified. Many women experience no sense of pleasure during or as a result of the sexual act, and regard it as only a means to an end; that is, the retention of the affections of her companion and the production of offspring. Some women experience so much physical discomfort during the act and such a degree of nervous irritation following it as to cause them to regard the approach of the male with absolute disgust and repugnance. The life of a woman of the latter class with an erotic man—a man who is so selfish as to care only for his own gratification—becomes a "hell on earth." She considers herself a sexual slave, bound to a man whose only regard for her is as an instrument to minister to his passion. Whatever regard she formerly entertained for him soon becomes dissipated. Constant dwelling upon her sense of wrong and fretting against the bonds which envelop her, leads not only to the production of local disorders but to melancholia, hysteria, neurasthenia—even mental derangement.

Equally disastrous is the union of a young erotic woman with an old and especially impotent man.

Stimulation of eroticism by bad literature, by intimate association with the opposite sex, or by onanism, are prolific in the development of local disease. Long engagements, unless occasioned by separation, are prejudicial in that the frequent hyperemia produced by repeatedly awakened and unsatisfied longings causes chronic oöphoritis.

The most potent factor to-day in the production of pelvic disease is a result of efforts to avoid maternity. Nature has her revenge upon those who would violate her laws. When the natural result of the marital relation is avoided by withdrawl of the penis before the act is completed both parties to the act are injured. The incomplete discharge causes the man an irritation which produces a sensation of discomfort and unrest that leads to more frequent coition and consequent nervous exhaustion, or neurasthenia for both participants. The continuous engorgement without the salutary influence of the completed orgasm and the failure of impregnation produces a continued hyperemia which renders the soil favorable for the development of the various pelvic inflammations. The deliberate indulgence of the sexual appetite with the premeditated intention of avoiding its legimate result, begets a lowered moral attitude toward the sexual relation. The woman who continually avoids the possibility and responsibility of maternity becomes little more than her husband's mistress, indeed, it may be questioned whether she is regarded so highly. If her sexual appetite be strong and she resents the apparent neglect of her husband, it does not become a long step for her to become the mistress of another. A woman so lost to the purpose of the marital relation will not hesitate to employ, or have employed, agents for the arrest of pregnancy when it occurs in spite of the precautions observed. Abortions or repeated abortions necessarily induce disorders of the pelvic organs. Nature makes her provision for the evacuation of the uterine contents when the fruit has matured and earlier separation finds it unprepared to resume normal relations easily. Involution is less rapid and prone to be incomplete. Subinvolution, descent, displacements, chronic endometritis and metritis, periuterine inflammation, and tubal and ovarian diseases are consequences of such interference. The genital organs may become so crippled as to render subsequent conception impossible, or so irritated as to render the uterus unable to supply the necessary nutrition to mature the implanted ovum and abortion becomes the habit.

d. *Traumatic Causes.* The injuries to which the genital tract are subject may be accidental, the result of violent efforts at intercourse, incident to parturition, or the result of operative procedures. The accidental injuries are comparatively infrequent, and, while capable of producing cicatricial changes, are generally insignificant in their ultimate effects. Coition has produced laceration of the perineum, tearing off of a rigid and resisting hymen, tearing of the vagina, and the formation of rectovaginal fistula. The act of coition is most likely to produce severe injury in the very young or in the elderly virgin. The greater majority of injuries occur from lesions of parturition. These may involve the body of the uterus, the cervix, the vagina, perineum, or pelvic floor, and the adjacent viscera. The lesion may be in the nature of a tear in healthy tissue which, if kept free from infection, soon heals, leaving only a more or less well marked cicatricial band; or, as a result of long continued pressure or bruising, is followed by extensive sloughing and loss of tissue, which, if recovery occurs, must be attended by deformity. Lesions of the genital canal are favored by malformations of the bony and soft part of the pelvis; small and contracted genital canal; undersize or malposition of the fetus; rigid and unyielding muscular structure; an inordinate amount of fat in the maternal tissues; enfeebled muscular action and ineffective labor pains by which the tissues are subjected to long continued pressure between the bones of the fetal head and those of the pelvis; and the rash and unskilful employment of manual and instrumental manipulation. The prompt and skilful resort to assistance has greatly lessened the frequency of severe lesions. It is true lacerations of the cervix and pelvic floor may be relatively more frequent under early interference, but such lesions are easily repaired and produce far less serious consequences than the extensive destruction of tissue resulting from protracted labor.

Any lesion of the pelvic floor becomes an avenue for the entrance of infection. Extensive lacerations of the cervix and pelvic floor interfere with the process of involution so that the organs are much longer in reaching the normal. This may be prevented by various sequelæ. In laceration of the cervix, in addition to subinvolution, the cervical lips are frequently separated. The posterior may undergo involution while the anterior becomes hypertrophied. Increased secretion occurs from the cervical glands or superficial inflammation may lead to stenosis of the gland ducts and distention of the Nabothian glands until the entire cervix has undergone cystic degeneration. In some cases the torn surfaces may become cicatrized, filling up the angles of the tear with wedges of cicatricial tissue, in which the nerve tendrils are imprisoned and pinched, producing various reflex phenomena. Occasionally the pressure of the cervix against the posterior wall of the vagina will lead to turning of the lips, the posterior upward and the anterior downward, in which position they are held by indurated tissue within the injured surfaces. The resulting endocervicitis, thickened mucosa, and distended glands produce ectropion of the mucosa, which increases the separation of the lips.

That this condition is an incentive to the occurrence of carcinoma of the cervix is made evident by the fact that this is most frequently found in the cervix and in the cervices of women who have given birth to one or more children. Laceration of the pelvic floor in slight degree lessens the support of the viscera, retards involution, and the combination of decreased support and increased weight of the superimposed viscera promotes descent, displacement, and chronic inflammation. Laceration through the sphincter leaves the intra-abdominal pressure unresisted and renders the patient unable to control the contents of the lower bowel. The seclusion enforced by this condition not infrequently results in melancholia and mental disturbance. Fistulous openings between the genital canal and the adjacent viscera produce constant soiling of the patient's person with urine or feces, irritating the skin of vulva and thighs, and make her a source of distress to herself and her friends.

The discussion of the traumatic causes of pelvic disorder is incomplete if some consideration be not given to those which result from operative procedure. They are mostly the result of want of skill, improper technique, inexperience, and faulty judgment. No man should undertake pelvic surgery who has not had large opportunity for observation in diagnosis, and a careful training in surgical technique. Every surgeon is saddened by seeing patients who had not been seriously ill prior to a cureting, with conditions demanding sacrificial operations; women bemoaning the loss of ovaries, who from the history evidently did not require such a sacrifice; and patients with fistulæ, hernia, adhesions, and intestinal constrictions, living lives of misery and discomfort, when they could have been restored to health readily had their operators been better trained.

e. *Infective Causes.* Inflammatory diseases of the pelvis are with extremely rare exceptions due to micro-organisms. Those which are most frequent in their baleful influence are the gonococcus, staphylococcus, pyogenes aureus, streptococcus, bacillus coli communis, and bacillus tuberculosis. The retention of portions of tissue which are exposed to the atmospheric air through the introduction of the saprophites cause putrefaction and through the absorption of the resulting toxins develop high temperature. The condition is denominated sapremia as contradistinguished from the multiplication of septic germs which produces septicemia.

The gonococcus is without question the most prolific source of infection and invades the vulvo-vaginal glands, vagina, cervix, body of the uterus, tubes, ovaries, and pelvic peritoneum. Its existence in a severe degree makes its cure uncertain. Certainly no case is cured in the sense of restoration to normal relations, nor can we be certain that subsequent symptoms will be in the form of sequelæ, for numerous cases occur demonstrating recurrence of the disease without opportunity for fresh infection. Such attacks burst forth following sexual excess, intemperance in eating or drinking, or after exposure, and have appeared when previous examinations of the secretions have demonstrated that the gonococcus was absent. Recent researches have seemed to demonstrate that gonococci lapse into forms indistinguishable from pus cells or leukocytes and return to their characteristic form when galvanized into activity by some irritation. Such an explanation accounts for reinfection in a previous victim and its transmission by him to others.

The gonococcus renders the infected soil more favorable for the reception and nutrition of other micro-organisms. The simultaneous action of some other organism with the gonococcus is known as a mixed infection. The retention of decomposing products and the occurrence of sapremia is also favorable for the development of the graver forms resulting in sepsis.

Infection from staphylococcus, or streptococcus, is always grave. Its progress depends upon the virulence of the infection and the vital resistance of the patient. It may become promptly localized or rapidly infect the blood and result in death. The bacillus coli communis is most likely to expend its baneful influence upon the peritoneum of the adjacent structures. The tubercle bacillus may affect any portion of the genito-urinary tract. Next to the lungs it probably invades the peritoneum most frequently.

f. *Causes Incidental to Age.* The most superficial observation reveals that the age of the woman renders her more susceptible to certain forms of disease. Some disorders are prone to occur at certain ages.

The period prior to puberty is especially free from disorder. It is a period of quiescence, and yet we find the individual suffering from gonorrheal infection which produces vulvo-vaginitis, a condition requiring prompt treatment to prevent its extension to the uterus and appendages, causing irrecoverable alterations. Ovarian growths occasionally manifest themselves during this period. With the advent of puberty the disorders multiply. Malformations render their existence recognizable by retention of menstruation; atresia in vagina or uterus; or imperforate hymen. A poorly developed uterus may be unable to perform its functions readily, so the patient suffers from dysmenorrhea and sterility. During the years of active menstrual life the chaste unmarried woman suffers from endometritis, oöphoritis, the occurrence of myomata, and chronic inflammation of the ovary. Ovarian tumor and, occasionally, carcinoma may be manifested. In the virgin, the latter is more apt to affect the body.

The married woman, while possibly slightly less susceptible to myomata, may undergo infection, producing endometritis, metritis, oöphoritis, salpingitis, and periuterine inflammation, either perimetritis or parametritis, or the two combined. She is prone to cervical carcinoma from the injuries the cervix receives during parturition. Such patients are more prone to infections from their greater exposure in the contingencies incident to the sexual relations, the possible interruption in the course of pregnancy, and increased exposure at the period of parturition.

Carcinoma, while possible at any period, is apt to manifest itself at or near the menopause. Ovarian cystomata are more frequent during this period, but may occasionally develop before or after the period of menstrual life. Subsequent to the menopause carcinomata, prolapsus, and senile endometritis are the affections most frequently seen.

DIAGNOSIS.

23. **Difficulties in study,** demonstrated by our discussion of etiology, are no less marked when the student of gynecology essays correct diagnosis. Probably in no department of medicine are greater barriers interposed to its accomplishment. In the study of the diseases of women, much must depend upon proficiency of touch which is acquired only by extensive practice. The delicacy and power of this sense varies so greatly in different individuals that it is difficult to convey an adequate idea of the relative hardness or softness of the structures under observation.

The ovaries and tubes in which important lesions occur are quite inaccessible in many patients to the ordinary methods of examination. Pathologic lesions, then, must often be the subject of inference or speculation, rather than capable of absolute demonstration.

To render the study of symptoms more difficult, the suggestion that she must subject herself to examination is repugnant to the modesty of every woman, and the disease exists in organs so sensitive that manipulation can not be repeated by a number of persons in succession. The patients who are willing to be brought before a class of students and subjected to such examination are exceedingly few, consequently many practitioners must enter upon their vocation with but little or no practical knowledge of the subject.

24. **The Cultivation of Habits of Close Observation is of the Utmost Importance.** The observant physician generally will be able to determine with considerable accuracy the circumstances, condition, and state of disease in a patient from her conduct, manner and general appearance. Thus, a woman with an abdominal enlargement, if she appears well nourished and enters the physician's office with a face presenting the rosy hue of health, would naturally be suspected of suffering from a physiologic rather than a diseased condition, and would be pronounced pregnant; while a pale countenance, emaciated face, thin cheeks, and sunken eyes associated with such an enlargement would be regarded as indicating an ovarian growth. This special association of the features is known as *facies ovariana*, and is of value in forming the diagnosis. The conduct and deportment of the patient will frequently announce whether she is married or single; her manner of walking or sitting, the existence of a pelvic inflammation.

25. **Exercise of judgment** will prevent those errors in diagnosis which are frequently the result of hasty conclusions founded upon insufficient investigation. Recognition of the existence of a lesion is at once

accepted as an explanation for all distressing symptoms. An accurate diagnostician will not permit his judgment to be swerved by the reasoning of another; nor come to the investigation with preconceived conclusions; but will form his decision only after a careful and thorough examination of every organ capable of producing such symptoms.

26. Value of Notes. The young physician should accustom himself to taking notes of his office cases. He thus forms the habit of more careful and systematic investigation of every patient, accumulates data from which he is enabled to formulate more definitely judicious plans of treatment, and, probably most important of all, has the means of refreshing his mind from time to time as to the condition of any particular patient.

27. History. The notes should record the *name*, *residence*, *age*, *condition of patient*, *married or single*, *family history*, *personal history* (as previous sickness, duration of present illness, supposed cause, progress, and symptoms).

Menses: first appearance, regularity, duration, what changes have since occurred; present habit, date of last menstruation.

Pain, whether it precedes, accompanies, or follows the periods, its character, severity, and where experienced.

Leukorrhea: amount of discharge, duration, continuance, color, consistence, and effect upon the parts with which it comes in contact.

Number of children or miscarriages: character of labor and convalescence and the influence upon subsequent health.

Coition: painful, sensation, frequency, methods employed to avoid conception.

Interrogation of other organs: regularity of alvine dejections, frequency of micturition, digestion; pain in head, in lumbar region, in groins, down the limbs, etc.

28. The subjective symptoms are elicited from the patient or her attendants. As already asserted, the difficulty experienced in determining the physical signs frequently makes these symptoms of great value. Every such symptom, however, must be weighed carefully, as both patient and attendants are prone to exaggerate its character and severity, or may err both in observation and interpretation.

29. Causes of Error. Lisfranc writes: "By their almost latent state, their great variety of symptoms (often very transitory), their sympathetic effects on all parts of the economy, and their immense influence on the nervous system, uterine diseases are peculiarly apt to lead medical practitioners into errors of diagnosis." (Clinique Chirurgicale de la Pitié, vol. ii, p. 182, Paris, 1842.)

The reason for these errors is the difficulty in understanding their cause. Uterine symptoms are not always the most prominent, are slowly developed, and do not always attract the attention of the patient. Not infrequently is the physician consulted for disorder of the stomach, of the heart, or of the liver; for vomiting, nausea, want of appetite, or diarrhea; for neuralgia or hysteria; for a train of evils having their origin in poverty of the blood, as chlorosis, anemia, emaciation, and exhaustion—all of which may be symptomatic manifestations of an obscure uterine malady.

The interrogation should proceed so systematically from general to local symptoms as to impress the patient, upon its completion, that the only logical course is a physical investigation of her pelvic organs.

30. **General or constitutional symptoms** may so predominate as to obscure the diagnosis wholly, and cause both patient and physician to believe that other than the pelvic organs are directly at fault. Complaint will be most frequently made of symptoms which may be denominated as gastro-intestinal, such as gastralgia, nausea, vomiting, perverted appetite, anorexia, and regurgitation associated with a clean tongue. Nausea and obstinate vomiting are likely to be associated with ovarian disease. So are intestinal indigestion, indicated by gaseous distention, the formation and absorption of toxins which disturb the sleep, cause unpleasant dreams, perverted nutrition and neurasthenia. Nervous anesthesia affects portions of the lower extremities, as over the front of the thighs. It is especially prone to extend to and involve the clitoris, genitals and vagina, when all sexual desire and pleasurable sensation during coition become lost. This condition is particularly associated with retrouterine inflammation and chronic metritis complicating retrodisplacement.

31. **Nervous Manifestations.** The bladder and rectum are frequently the seat of burning, uneasiness, or spasms of pain, but such disturbances are not confined to them for remote organs are also affected, such as liver, stomach, intestinal canal, and heart. Patients not infrequently suffer from symptoms which cause them to believe themselves the victims of serious disorder of the heart. These entirely disappear upon proper treatment directed to a pelvic lesion.

Neuralgia in the lumbar and dorsal regions,—intercostal neuralgia of the left side,—leading the patient to fear the existence of organic heart disease, is common. The *trifacial nerve* may be involved, producing the sensation of a nail being driven into the head. *Sympathetic pains* are frequently noticed in the heart, with a sensation of swelling, especially marked during menstruation. I have often observed intense pain in the breast associated with a chronic inflammation of the corresponding ovary. The pain is usually ameliorated or absent during menstruation, but aggravated during the menstrual intervals.

Motor and sensory paralysis is not an infrequent concomitant of uterine disorder. It is sometimes difficult to recognize its cause. Occasionally it is unquestionably due to hysteria, but numerous cases can be cited where the replacement of a retroverted uterus has resulted in the rapid restoration to health of patients who were apparently suffering from complete paraplegia. I have seen a patient in whom the incoördination of motion was so marked as to lead to the diagnosis of advanced locomotor ataxia recover without a vestige of the disorder subsequent to an amputation of a hypertrophied and inflamed cervix and the repair of a relaxed pelvic floor.

32. **Disorders of Nutrition.** Every physician is familiar with the profound influence upon the processes of nutrition frequently engendered by the occurrence of pregnancy. It does not seem unreasonable to antici-

pate that the substitution of a pathologic lesion for a physiologic condition will exert equal if not greater disturbance of these processes and an impoverished condition of health necessarily results. Doubtless the disturbed balance of the internal secretions has much to do with the production of such disturbances. The conditions which most frequently occur are chlorosis, anemia, and general debility.

Chlorosis is found in poorly nourished girls who suffer from it at puberty, or frequently in women during pregnancy. That it is often a result rather than a cause of pelvic disorder is made evident by the rapid improvement of the patient through the establishment of the menstrual function or the termination of a pregnancy.

Anemia may occur at any age. In the earlier periods of life it may be both a consequence and cause of pelvic disease. It is especially associated with chronic inflammation of the uterus and appendages. It is marked in uterine myomata of the interstitial and submucous varieties, in the various forms of malignant disease, and in chronic inflammation of the urinary tract. Repeated and prolonged hemorrhages, continuous leukorrhea, loss of rest from pain, or from frequent micturition are contributing causes. The condition is indicated by loss of color in the skin, transparency of the tissues, local edema, frequent weak pulse, and general debility. These disturbances of nutrition are accompanied not only by general debility, but also by progressive emaciation, until the disorder producing them has been corrected. Under the influence of the diseased condition the patient becomes prematurely aged. The head is stooped, the limbs are bent, the features are drawn, and she presents a look of suffering; the flesh is soft and flabby; the countenance is expressionless, the complexion pale and faded, especially when leukorrhea has been long continued and profuse. The paleness is different from that of ordinary anemia; it causes the characteristic appearance that has been recognized under the name of *facies uterina* (Courty). Emaciation may not always be present; on the contrary, the patient may sometimes be corpulent, particularly when amenorrhea, rather than leukorrhea or hemorrhage, occurs. The obesity is sometimes so great as to lead the patient to believe herself pregnant, and not infrequently, while suffering severely, she is congratulated by her acquaintances upon her excellent appearance.

33. **Local symptoms** are those disturbances of function and disagreeable sensations which are directly traceable to the genital organs and the structures in immediate association with them.

These symptoms comprise: discomfort in sitting, a sensation of weight and pressure in standing or walking, heat and burning in the vagina, pain upon movement, tenderness to pressure over the abdomen, frequent and painful micturition, more or less profuse discharge, absent, too frequent, irregular, and painful menstruation, pain during the act of coition or even upon touching the vulva, and a sensation of distress and aching following the sexual relation. Reflex phenomena from the rectum or bladder, or, on the other hand, sympathetic irritation of the uterus, when either of the former organs is the seat of disease, are very common, and the frequency of their occurrence can be appreciated when we remember that the nerve supply to the uterus, rectum, and vagina is derived from the cervicouterine ganglia of the hypogastric plexus.

34. **Rectal Reflexes.** It is not unusual to find that during menstruation women suffer from *diarrhea*, proctitis, and rectal tenesmus. The pelvic vascular system is so general that engorgement or inflammation of the uterus will not fail to produce congestion in the other pelvic organs; and in any marked inflammation of the organ, associated with displacement, and particularly in retrodisplacements, the hemorrhoidal vessels will be found to be distended; thus, *hemorrhoids* in the female very frequently result from retrodisplacements of the uterus, and never should be subjected to operative treatment until the displacement has been corrected. In anteversion the cervix will frequently be found to project against the anterior wall of the rectum, and can be readily distinguished through this viscus. When the cervix is inflamed, the impingement of hard fecal matter against the organ not infrequently causes severe pain. In some cases this pain is experienced only during menstruation. The most frequent functional disorder of the rectum is constipation; partly from neglect, and partly from want of nerve irritation, the bowel becomes filled with fecal matter, the watery portions are absorbed, and hard, dense, scybalous masses form, which are evacuated with difficulty, and possibly only after repeated enemata. The muscular coat of the bowel becomes distended, loses its tone, and results in a form of paralysis; fecal matter undergoes decomposition, is partly reabsorbed, and causes the condition which Barnes has denominated as *copremia*, in which the skin is of a sallow, dirty hue, the breath and emanations from the skin, foul; the patient suffers from dyspepsia, flatulence, and pyrosis—a condition akin to that known as uremia. The violent efforts to evacuate the bowels not only lead to the formation of hemorrhoids, fissure, sometimes fistula, but, through the increased intraabdominal pressure they may cause displacement of the uterus and the vagina. When fissures exist, the pain during defecation is so great that the patient is likely to permit the bowels to go unevacuated rather than endure the resultant pain.

35. **Vesical Reflexes.** The relation of the bladder to the uterus is more intimate than that of the rectum, and consequently this organ is much more likely to sympathize with inflammatory conditions of the uterus. Retention of the urine may be produced by pregnancy or by pelvic growths, such as fibroid tumors or tumors of the ovaries. Sometimes as a result of irritation of the orifice of the vagina, a condition known as *vaginismus* occurs. The pain may be so great as to produce a spasmodic contraction of the sphincter of the bladder. The most usual functional derangement of the bladder, however, is *frequent micturition*. It may occur as the result of reflex irritation from the pelvic organs, or in consequence of pressure from the uterus produced by the presence of a tumor or by a pregnant uterus, or a displaced organ in which either the fundus rests forward upon the bladder or is turned backward, causing the cervix to press against the latter. Either of these conditions may lead to functional derangement of the bladder, so marked as to cause the patient to suspect the existence of

disease of that organ, or, as she will more probably say, disease of the kidneys.

36. **Genital symptoms,** attributable to the genital organs, are derangements in the performance of their functions. The particular symptoms are disturbances of menstruation, such as a decreased, increased, or irregular menstrual flow; the existence of sterility; the presence of pain and excessive discharge. Consequently, in determining the history of the patient, if she is married we endeavor to elicit information regarding previous pregnancies and the character of the labors. *Sterility* in a woman who has been married for a number of years is an indication of some abnormal condition. It may be due to a malformation, functional disturbances, actual disease, or efforts to avoid the responsibility of maternity. It should be remembered, however, that there are cases of relative sterility and that the male alone may be responsible for the failure to procreate. The most unvarying function of the uterus is that of menstruation, consequently some disturbance in the performance of this function is one of the first indications of the existence of uterine disorder. *Amenorrhea* is a term employed to designate absent or greatly decreased menstrual flow; *menorrhagia* the flow, which though regular is increased or prolonged; *metrorrhagia*, a discharge of blood, often a hemorrhage which bears no relation to the normal period; while *dysmenorrhea* indicates the existence of pain occurring at the beginning of, during, or immediately following the menses. The conditions will be considered more fully later. (See Functional Disorders.)

37. **Hemorrhage** is by no means a constant symptom of uterine disease. Its significance varies according to the amount of blood lost and the time of life at which it occurs. During the earlier periods of menstrual life it is not uncommon for the menses to be profuse, as a result of insufficient or overabundant production of the internal secretion of the ovary. When hemorrhage occurs in women who have borne children, it may be produced by inflammation of the mucous membrane of the uterus —hence a hemorrhagic endometritis. Hemorrhage is a usual symptom of fibroid growths of the submucous variety. *Uterine polypi*, whether due to a fibroid growth or to vascular growths upon the endometrium, are a very prolific cause near the climacteric. The occurrence of hemorrhage near or subsequent to the menopause should always cause the physician to suspect the possibility of malignant disease in either the mucous membrane of the cervix or the body of the uterus. When hemorrhage occurs during or following pregnancy, it is probably due either to a threatened abortion or to retention of portions of the fetal envelopes. It should not be forgotten, however, that hemorrhage may occur from cystic disease of the ovaries, and in any condition affecting the vascular tension, even though no pelvic lesion is apparent, as in valvular disease of the heart, Bright's disease, and obstruction of the portal circulation of the liver. The occurrence of hemorrhage should always be regarded as an important danger signal demanding careful investigation to determine the cause.

38. **Pain** is a very frequent symptom and may be associated with the menstrual function, when it is known as *dysmenorrhea*, or may be in-

dependent of it. When it occurs during coition, it is called *dyspareunia* (Barnes). It may be dependent upon, first, vaginismus; second, chronic nervous irritability due to incomplete or awkwardly performed first coitus; third, inflammation; fourth, tumors; and fifth, malformations.

Courty describes six seats of pain, three of which are principal and three accessory. The principal seats are: 1, the iliac regions; 2, the loins; and 3, the hypogastrium.

Iliac pain is the most frequent. It is felt in the iliac fossa, from which it extends to the hypogastric and lumbar regions, particularly toward the pelvic brim and cavity. It is most often felt upon the left side and is due, probably, to tension of the broad ligament occurring more frequently upon the left side because of the arrangement of the venous circulation. The left ovarian vein enters the left renal at a right angle, and passes behind the sigmoid flexure of the colon to reach it. The frequent impaction of this portion of the gut with feces accounts for the obstructed circulation.

Courty ascribes the pain in this region, however, to the inclination of the uterus to the right; hence, any increase in its size causes a dragging upon the left broad ligament.

Lumbar pain, generally spoken of as backache, is felt in the lower part of the lumbar region, sometimes extends over the kidneys, or, more frequently, down over the sacrum. Occasionally the abdomen is encircled as with a belt of pain. This pain is usually ascribed to traction of the utero-sacral ligaments. Doubtless it is frequently due to retention of secretion within the uterine cavity, by which the organ is obliged to go into labor to secure its expulsion. Pain particularly marked in the sacrum indicates disease of the cervix and is doubtless caused by retrodisplacement of the uterus.

Hypogastric pain is felt above the pubes and most probably has its origin in the uterus. It is artificially elicited rather than occurring spontaneously. Even patients who do not ordinarily experience it, complain as soon as pressure is made over the lower portion of the abdomen. This pain is greatly aggravated by walking, so that the patient frequently feels the necessity for support over the hypogastrium by means of a belt or by placing the hands in front, partly for support and partly for protection against injury.

The accessory seats of pain described by Courty are found: 1, in the anus or perineum; 2, in the vagina or cervix; and 3, in the cavity of the pelvis.

Anal or perineal pain is usually produced by a retrouterine tumor or retroflexed uterus. A patient with a hypertrophied or inflamed cervix will frequently suffer pain in the anus or perineum while walking or riding, and often when sitting.

Vaginal pain is more rare. It is felt particularly during an orgasm by women who have inflamed uteri.

Pelvic pain results usually from inflammation about the uterus or tubes, fixation of the ovaries, or when organs have become cystic or the seat of pus collections.

39. **Leukorrhea,** or whites, is a term given to discharges, other than

sanguineous, that occur from the genital tract. To appreciate the significance of a discharge as an indication of disease, we must recognize the character of the normal or physiologic secretion.

The secretion from the Fallopian tubes and cavity of the uterus is a thin, whitish, alkaline fluid, while that from the cervical glands, also alkaline, is very viscid, tenacious, and transparent like white of egg.

The secretion of the vagina and vulva is whitish, made up of a serous fluid, mixed with scaly epithelium. The vulvar discharge also contains oil globules from the sebaceous glands. The secretion of both vagina and vulva is acid.

The superfluous discharge from the cervix is coagulated by that of the vagina, forming a smeary material at the upper part of the vagina, which will be found to coat over the surface of a pessary. When the cervical fluid is in excess, it may pass from the vagina unchanged and perfectly transparent.

Another discharge or secretion takes place from the vulvovaginal glands during coition or under excitement. This is clear and viscid. In very erotic women this discharge is ejected upon the approach of a person of the opposite sex, and nocturnal discharges occur during erotic dreams.

It is sometimes difficult to determine whether a discharge is the result of over-stimulation of a physiologic secretion, or is produced by a pathologic condition. A profuse discharge is not an infrequent result of exposure to cold. An increased secretion from the uterine glands occurs instead of the ordinary nasal flow. A hypersecretion resulting from hyperemia of the pregnant uterus may be considered physiologic. In undeveloped and strumous young women a leukorrhea often occurs as a substitute for the menses. In many individuals a slight leukorrhea preceding or following the menses has no abnormal significance.

The origin of the abnormal discharge generally can be determined by its appearance and character. When from the cavity of the uterus, it will be thin, watery fluid, loaded with ciliated columnar epithelium, and containing also pus and blood-corpuscles, according to the extent of the disease. The discharge may be a continuous flow. More frequently it is intermittent, due to defective drainage from swelling of the mucous membrane of the outlet, which leads to dilatation of the cavity and not infrequently of the orifices of the tubes. The uterus then empties itself by occasionally going into labor to evacuate its contents. Such a fluid, loaded with pus and blood-corpuscles, coming away in gushes, leads the patient to believe that an abscess has formed and been evacuated. Patients will assert that they have abscesses form and discharge at short intervals. The conditions described, however, may not be the only solution. An accumulation in a tube, the uterine end of which is still patulous, may drain at intervals through the uterus. Such a condition has been denominated *hydrops tubæ profluens*.

Other sources of purulent discharges are found in the rupture and escape into the vagina of the contents of a tubal or peritoneal abscess; of a suppurating ovarian tumor; of an extrauterine pregnancy sac; or of an abscess about the vermiform appendix. The discharge from the cervix is usually viscid and tenacious. It may be clear and transparent or clouded by desquamated epithelium and filled with pus-cells, when it is yellowish or greenish-yellow in color, or it may be a dirty brown from admixture with blood-corpuscles.

The cervix will usually be dilated and patulous, its membrane thickened, abraded, and covered with papillæ. The discharge from vulva and vagina, is thin and serous and resembles that from eczema. After puberty, in the unmarried, it is generally vaginal. In the more mature and in married women it is usually uterine.

As the individual approaches puberty the vulvar discharge becomes oleaginous from the secretion of the sebaceous follicles. In uncleanly persons the secretion from these glands is so abundant that it often accumulates between the large and small labia, decomposes and sets up an inflammation similar to the blennorrhea of the male. Prior to or following the climacteric a thin, watery flow, of a sweetish, sickening, or decayed flesh-like odor, should be considered a strong indication of cancer of the uterus.

40. **Physical Signs.** Careful study and analysis of the subjective phenomena may afford an approximate idea of the disorder present, but the diagnosis should not be attempted until the objective symptoms or physical signs have been investigated.

The physical signs are determined by employment of all the senses except that of taste.

Sight is employed in the inspection of the abdomen and external genitalia and in examining the internal organs by use of the speculum.

Touch is practised in abdominal palpation and percussion, in simple vaginal or rectal touch, in conjoined manipulation, and in the use of the sound or catheter.

Hearing is employed in percussion and auscultation.

Smell is exercised in the examination of discharges.

41. **Examination** may be made through the vagina, rectum or urethra, or a combination of one or more of these with pressure over the abdomen. The examination may be pelvic or abdominal (although in practice it is preferable to combine the two) and consists of inspection, palpation, percussion, auscultation, combined palpation, instrumental investigation and exploratory puncture or incision.

42. **Positions.** The patient may be placed in one of six positions for examination: 1, dorsal; 2, lateral; 3, semiprone (Sims'); 4, genupectoral; 5, Trendelenburg; and 6, erect. Of these positions the dorsal and the Trendelenburg are the most important.

1. *The Dorsal Position.* (Fig. 46.) The patient lies upon her back, with the limbs flexed and feet placed upon supports. The feet may be on a level with the buttocks or placed on supports a foot higher. This affords greater relaxation to the abdominal muscles. The clothing is lifted over the knees. The lower part of the body has been previously covered with a sheet folded about the widely separated limbs. This position permits inspection of the vulva, and the ready practice of

bimanual examination. It is the most favorable for vaginal and abdominal palpation and use of the valvular and Edebohl's specula. For operative procedure the dorsal position may be favorably modified by flexing the legs strongly upon the body, in which posture they may be retained by assistants or the employment of a suitable leg holder. This is known as the lithotomy position.

2. *The Lateral Position.* The patient lies upon the left side, with the limbs at a right angle to the body. This position was formerly much used by English gynecologists, and was preferred because it permitted examination to be made without danger of touching the tender structures at the anterior part of the vulva. This position was thought less vulgar, and it allowed the finger to follow more readily the curve of the sacrum and to reach with greater ease the highly situated cervix. Its chief advantage, however, is in permitting more minute investigation of the lateral fornices of the vagina. In abdominal palpation it affords increased opportunity of recognizing changes of position of tumors and displacements of the viscera, particularly of the kidney.

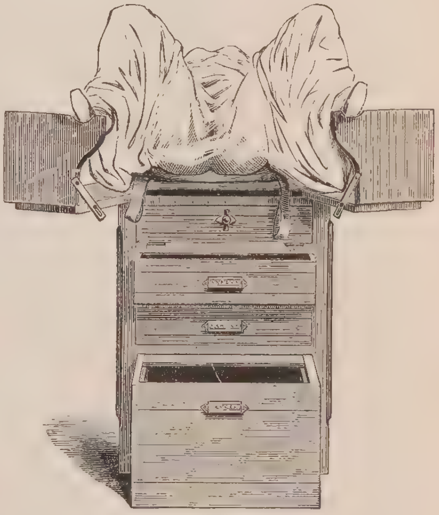


FIG. 46.—Dorsal Position.

3. *The Semiprone or Sims' Position.* (Fig. 47.) The patient is placed upon the left side and chest, with the left arm behind her, the left leg partly extended, the right being flexed at a right angle to the body. The intra-abdominal pressure is neutralized. The mobility of the uterus is readily determined, replacement more easily accomplished, and some anteflexions recognized as the organ falls forward that are not apparent in any other position. The chief value of the position is in the use of the Sims' speculum.

4. *The genupectoral position* (Fig. 48), also called the knee-chest position, is one in which the patient rests upon the chest and knees. The left side of her face rests upon her left hand. The thighs are at right angles to the surface of the table. The chief value of this position is in replacing a retrodisplaced uterus or prolapsed ovary, or for elevating from the pelvis a more or less impacted tumor.

5. *The Trendelenburg Position.* The patient lies upon her back on a plane inclined at an angle of 45 to 60 degrees, with the feet and legs over a flap of the table (Fig. 49). Heavy patients should have additional support by the application of shoulder pieces. Pryor modified the position by supporting the patient from the shoulders and flexed the legs upon the body for the purpose of examination of the pelvic viscera free from the

intestines, which gravitate upward when free to do so. This posture is of especial value in cystoscopic investigation of the bladder. The greatest value of the Trendelenburg posture is in the freedom of view afforded in abdominal section, permitting the operator to employ the sight as well as touch.

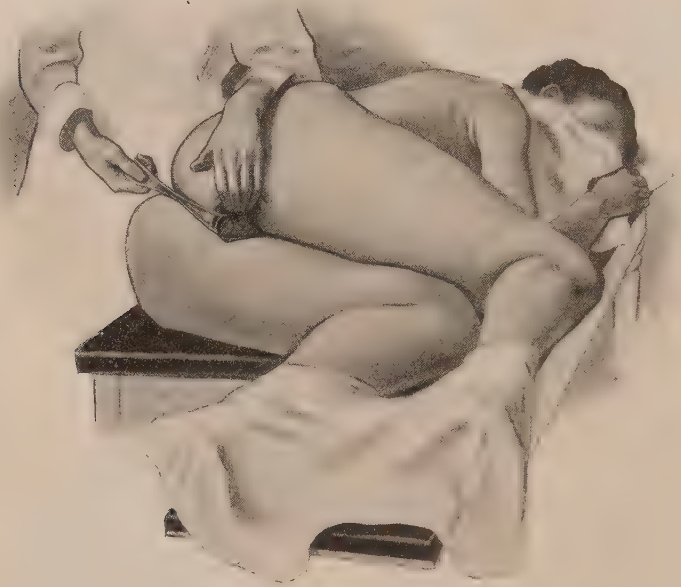


FIG. 47.—Sim's Position. Proper Method of Holding the Speculum.

6. *The erect position* is of limited application. The patient stands with feet separated, with one hand resting upon the shoulder of the physician, while he sits or kneels before her and introduces the index-finger into the vagina. The chief value of this position is in determining

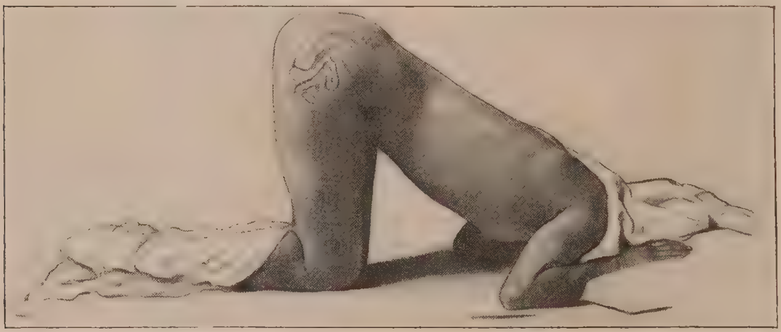


FIG. 48.—Genupectoral Pōsition. Organs Shown in Outline.

the amount of downward displacement of the pelvic contents and in securing ballottement in the early stages of pregnancy.

43. Preliminaries. The verbal examination having been so conducted that, when it is completed, the patient will be impressed with the fact that a physical examination is the only logical course, the examination may be made on a sofa or common bed, as would be the custom when made at the home of the patient. In office practice, however, it will be found more convenient to provide a suitable table or chair. The choice of table will depend upon the custom and convenience of the operator. One made by Codman & Shurtleff, of Boston, known as the Chadwick table, is very satisfactory. (Fig. 50.) In the first examination for the consideration of obscure conditions the clothing should be loosened and corsets removed, so that the abdominal walls can be completely relaxed. The bladder and rectum should be empty. The latter sug

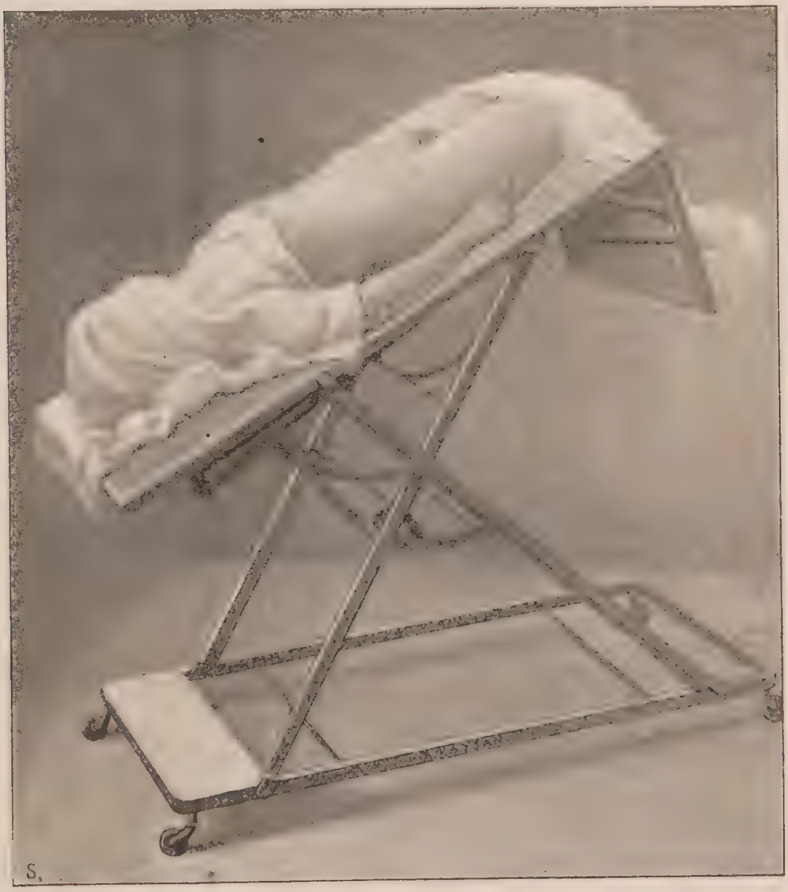


FIG. 49.—Trendelenburg Position.

gestions are very important in order to permit the normal relations of the uterus and its adnexa to be determined. Fecal accumulations have been mistaken for ovarian and tubal enlargements or inflammatory exudates. A distended bladder has been confounded with an ovarian tumor.

The abdomen of every woman applying for first examination should be exposed from the symphysis to the diaphragm. This is accomplished by covering the lower extremities with a sheet which is drawn over the symphysis while the clothing is pulled upward. Constricting clothing should be so loosened that, when desirable, the mammæ also may be inspected and palpated. Such an examination permits the recognition of changes in the mammary gland, ptoses of the abdominal viscera, tumors, hernia, gall-bladder and appendiceal disease, which would otherwise be overlooked.

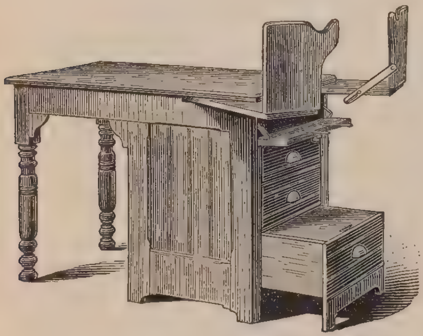


FIG. 50.—Chadwick Table.

44. Inspection of the Abdomen. An inspection of the external surface of the abdomen is of great value. The linea nigra, linea striata, and increase of pigment about the umbilicus and lower abdomen are signs indicative of a previous or present pregnancy. These discolorations having once occurred are never effaced, and are consequently of significance only during a first pregnancy. The linea striata are red or purple, when recent; white and glistening, when old. They are caused by overstretching of the skin, hence may result from any abdominal enlargement. Discolorations from blisters and counterirritants or scars from leech bites and wet-cups are indications of previous inflammation. The superficial abdominal veins are enlarged by any pressure upon the deeper vessels, and the enlargement occurs in pregnancy, in fibroid, ovarian, and other large tumors. The subcutaneous tissues become edematous in general dropsy and from acute abdominal inflammation. The association of enlargement with the affected viscera is more readily effected by dividing the surface into quadrants, by vertical and transverse lines crossing at the umbilicus. (Fig. 52.) The abdominal enlargement may be symmetrical, irregular or nodular; the abdomen flattened and broadened in ascites, or narrowed and projecting in pregnancy, myomata and ovarian cysts. The tumor may be spheric, most prominent above to the right in pregnancy, rise abruptly, attaining its greatest prominence near the umbilicus in ovarian cystomata, but is less likely to be symmetric in myomata. The surface of the skin is smooth and glistening from internal enlargement, and hangs in folds over the symphysis in obesity. A dependent mass may be due to the protrusion of a large tumor between the separated recti muscles, or to a desmoid tumor of the abdominal walls. A large projection from the median line may be caused by a ventral hernia. Fetal movements, contraction of muscles, and peristaltic action of the intestines often can be seen. Enlargements in the upper right quadrant of the abdomen are due to growths in the liver, distention of the gall-bladder, enlargement of the right kidney, or malignant disease of the ascending or transverse colon. In the median line, the liver, stomach, pancreas or transverse colon may be the seat. Above in the left quadrant, the spleen, the left lobe of the liver, the cardiac end of the stomach, or the left kidney may cause enlargement; and below, the descending colon. Ptosis of the stomach and liver frequently can be recognized. In the lower abdomen, the genital organs are the seat of the majority of abnormal growths. A tumor in the right lower quadrant should always awaken a suspicion of appendiceal inflammation or malignant disease of the colon.

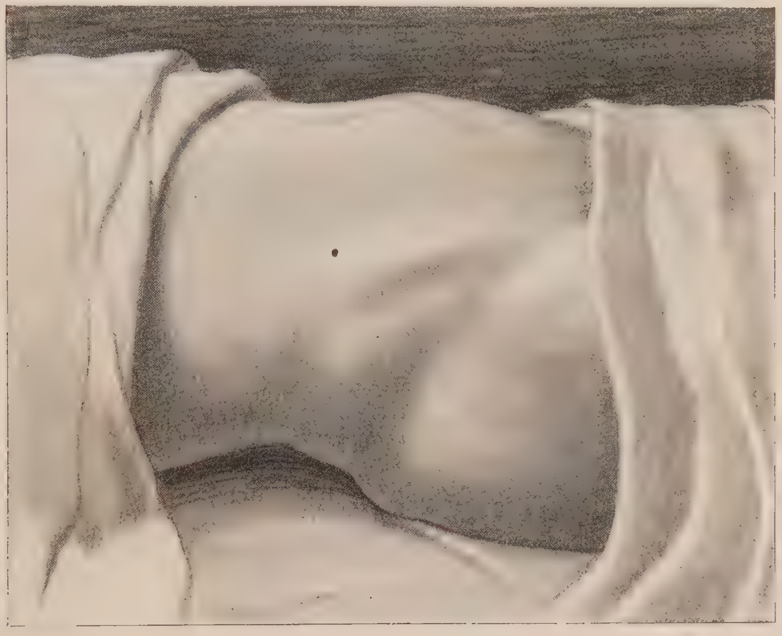


FIG. 51.—Abdomen Prepared for Examination.

45. **Palpation** may be practised during inspection and consists of placing the hands, previously warmed, upon the bare abdomen and gently moving them from side to side, now close together, or again bringing the entire abdomen between their grasp. The tips of the fingers or the entire hand may be applied. Palpation enables us to recognize the thickness of the abdominal walls, the presence of an abnormal growth, its situation, density, mobility and relation to the abdominal viscera. Its dimensions, smoothness or irregularity are recognized by carefully outlining the tumor. The relations and mobility of the tumor are determined by changing the position of the patient or forcibly moving the tumor.

The patient should lie on her back with the limbs flexed and the head and shoulders slightly elevated. Her confidence and coöperation must be obtained in order to secure muscular relaxation. It is necessary to proceed with the utmost consideration and gentleness, as rough, hasty and inconsiderate palpation causes muscular rigidity and defeats its object. Pelvic abnormalities may require vaginal touch in conjunction with palpation. This will be discussed under bimanual examination. (§50).

The examination may be made difficult by a large deposit of fat in the abdominal walls or the rigidity of the muscles from fear or actual tenderness. Generally this can be overcome by reassuring the patient. In inflammatory collections great care must be taken to prevent the rupture of the growth and the escape of its contents into the peritoneal cavity.

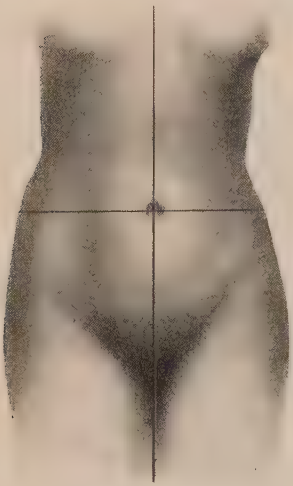


FIG. 52.

46. Percussion may take place as a part of the two preceding steps, and consists in eliciting resonance or dulness by mediate or immediate percussion. Fluctuation is recognized by placing a hand upon one side and striking upon the abdomen, more or less remotely, with the finger-tips of the other.

A long wave indicates that the fluid is free or contained in a large sac. A short or indistinct wave is produced by fluid contained in a sac with numerous partitions or septa. The chief value of percussion is in determining solid or fluid tumors from distentions of the abdomen by gas or ascites.

The ability to elicit resonance and dulness is utilized in the diagnosis between free fluid within the abdomen and that contained within a cyst. In the former a zone of resonance is elicited over the summit of the distention, while the remainder of the surface will be dull. This zone of resonance changes with the position of the patient. In a cyst the dulness is over its surface while the resonance is above and generally upon one side. Here the relative outline of the zones of resonance and dulness is not affected by change of position. The solid or cystic tumor, as it increases in size, pushes the viscera upward and to the opposite side; hence the situation of the zone of resonance. Resonance at the summit of the swelling in ascites is due to gas in the intestines which floats them to the surface. Should the mesentery be too short to reach the surface, from inflammation or great abdominal distention, percussion gives dulness; while deep pressure displacing the intervening layer of fluid again affords resonance. In localized peritoneal accumulations, percussion aids only in defining their boundaries, and presents the sensation of fluctuation.

47. Auscultation is practised directly by placing the ear over the abdomen, with a towel or sheet intervening; and, indirectly, through the medium of a stethoscope. The former enables the physician to find the sound rapidly, the latter to study it minutely. Auscultation is of limited application. It enables us to hear the fetal heart-sounds, the bruit produced by the rush of blood through the uterine sinuses, and various sounds induced by gas and liquids in the intestines. The fetal heart-sounds are characteristic of pregnancy; the bruit is heard in pregnancy and fibroid tumors alike. Efforts have been made to diagnose the seat of intestinal obstruction by the gurgling noise in the intestines, but our knowledge of the normal sounds is not sufficiently definite to enable us to make it of much value.

DIAGNOSIS: DIGITAL EXAMINATION.

48. **Examination of the Pelvis.** Passing from the examination of the abdomen to that of the pelvis, the sheet is draped about the limbs of the patient to expose the vulva. This permits the condition of the external organs to be seen without shocking the sensibilities of the most modest. Information is secured as to cleanliness; the presence of pediculi; venereal warts or sores; malformations; traumatisms; vulvar eruptions; tumors; elongation and thickening of the labia minora; hypertrophy of the clitoris; elongated or adherent prepuce; lacerations of the perineum; the presence of hemorrhoids, anal ulcerations or fissures; urethral caruncle; anomalies of the hymen; cystocele, rectocele; prolapse of the uterus; and the quantity and character of the vaginal discharge. This information through the eye is secured during the digital examination.

49. **Digital examination** or simple touch is practised through one or all of the three apertures or perforations of the pelvic floor, the urethra, the vagina and the anus. The vagina is preferred usually as it affords the most extended information.

The physician should cleanse his hands carefully. If she does not fear the possible danger of conveyed infection, the educated woman will be doubtful when her attendant proceeds to the examination with unclean hands or nails. The latter should be cut close. Either hand may be used. Occasionally it may be desirable to use first one and then the other. In a roomy vagina two fingers should be introduced, as thus additional length and surface for touch is secured. The fingers should be lubricated with soap or an unguent like carbolized alboline. The soap is preferable, for in washing it is removed with the secretions. In some patients, however, it aggravates any existing irritation. With one hand the physician separates the vulva in order to avoid carrying up the hair, and holds the labia separated as he proceeds to make the digital examination. Pressing back the perineum, the finger or fingers enter easily without impinging against the delicate anterior structures. Depression of the perineum with the index finger while the middle finger is inserted over it permits the employment of two fingers with little discomfort. The unemployed fingers of the hand can be carried back, either extended or closed, but the latter shortens the distance accessible to touch. (Fig. 53.) Touch affords information as to the presence of cysts in the labia, size of the vagina, relaxation of its walls, condition of its mucous membrane, amount of secretion; tenderness and distention of the rectum;

inflammation and projection of the urethra; tenderness, prolapse and distention of the bladder; and the relation of the uterus to the vaginal axis. Normally, the cervix looks backward, the axis of the uterus being nearly at right angles to the vagina. The situation, size, and density of the cervix are recognized. It may be normal, lacerated on one or both sides, or present a number of fissures—a stellate laceration. Its lips may be soft and velvety, from enlarged papillæ; nodular, from enlarged or cystic Nabothian glands; widely everted and dense, from chronic inflammation following laceration; enlarged and indurated, from chronic inflammation or malignant infiltration; enlarged, friable, or excavated in epithelioma. The os will be a slightly transverse depressed dimple when normal. If abnormal, it may be fissured laterally, bilaterally, through the anterior or posterior lip, or in a number of directions. It may be closed firmly, or stand open to such a degree as to admit the finger. The spaces about the vaginal projection of the uterus are known as the fornices. The posterior fornix is the deeper; the anterior is slight. The resistance and density recognized indicate the existence or absence of inflammation. A mass felt in the posterior fornix, if continuous with the cervix, whose axis is parallel to that of the vagina, is a retroversion of the uterus. If there is an angle between the mass and the cervix, the condition may be a retroflexion of the uterus, a tumor of the posterior uterine wall, an enlarged ovary or tube, or an inflammatory exudate. Digital examination also affords an idea of the mobility of the uterus, but the investigation is confined to its lower segment.

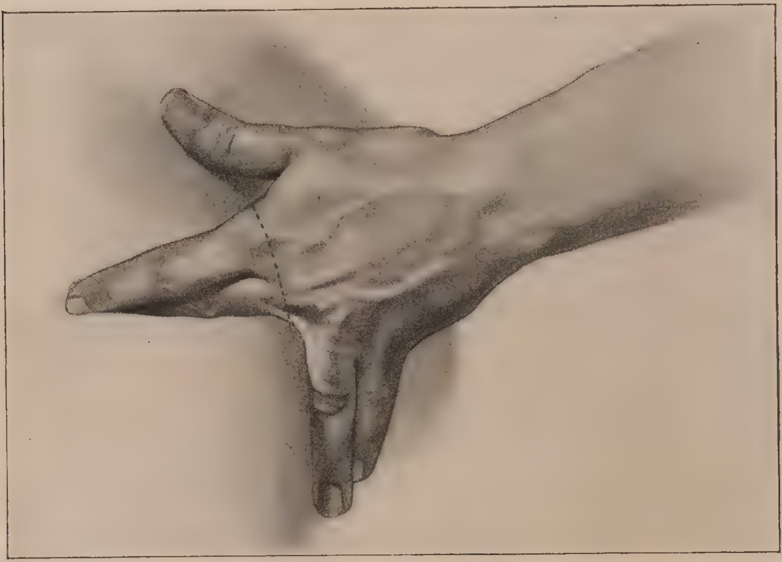


FIG. 53.—Proper Position of Fingers for Examination.

50. **Bimanual procedure**, also called conjoined manipulation, or vagino-abdominal touch, affords definite information. In every exam-

ination the introduction of one or two fingers into the vagina should be associated with the application of the fingers of the other hand upon the abdomen. The external hand may be placed about midway between the symphysis and umbilicus, pressing downward upon the anterior abdominal wall. It may be moved from one side to the other, in order to examine the contents of the pelvis. This procedure enables us to outline the size, shape, density, and situation of the uterus, and to determine the presence of growths in its walls and its relation to other pelvic growths or to inflammatory deposits. The normal tube is rarely palpa-

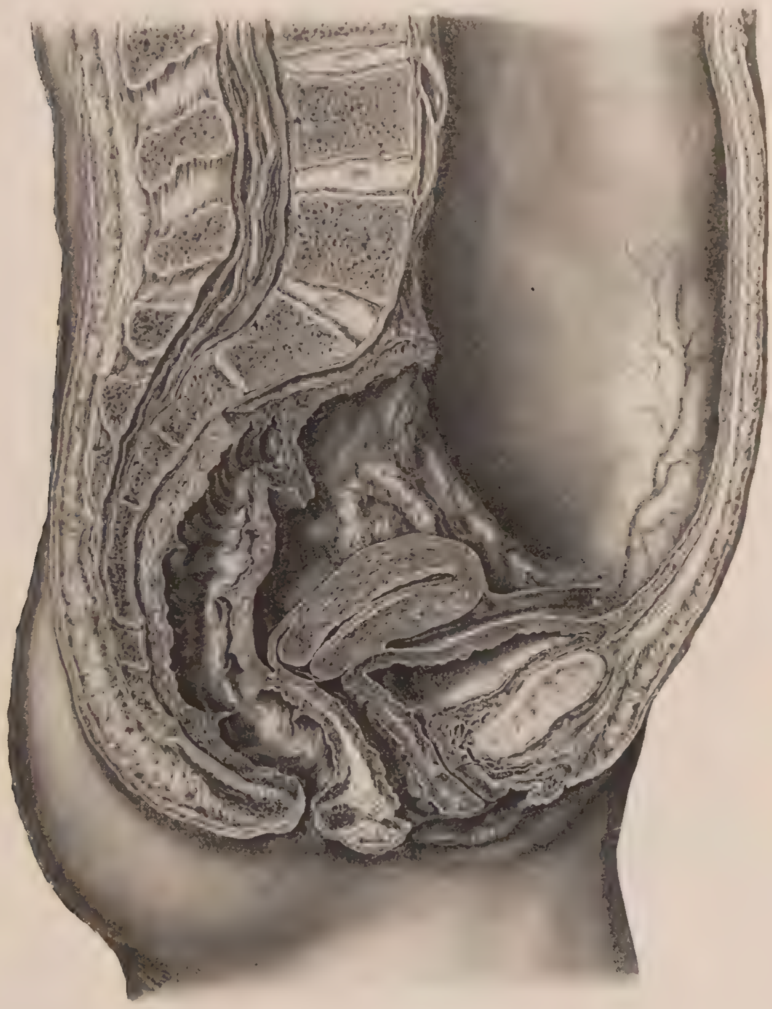


Fig. 54.—Half Section of the Pelvis with Patient Erect, Showing Normal Position of the Uterus. (*Deaver.*)

ble. When it is readily perceived, it has been the seat of an inflammatory condition. The ovaries are more easily recognized. To arrive at a definite conclusion in an obscure case, it is better to introduce into the vagina one or two fingers of the hand corresponding to the ovary to be palpated, as the extreme rotation necessary to bring the sensitive surface of the finger in contact with a small mass diminishes the sense of perception (Fig. 55.)

The examination is rendered difficult when the abdominal wall contains a large deposit of fat, or the muscles are rigid. The rigidity is sometimes so marked that determination of the pelvic condition is unsatisfactory. When due to nervousness, much can be accomplished by allaying the patient's fears and securing her coöperation. She should be directed to breathe with the mouth open and to sigh deeply, while the external hand depresses the wall during expiration, thus outlining the pelvic organs. Often by diverting the patient's attention through inquiries regarding other symptoms, the difficulty is overcome. When the nervousness is persistent, or the sensitiveness arises from an inflammatory condition, or the abdominal walls are very thick and fat, an anesthetic may be required.

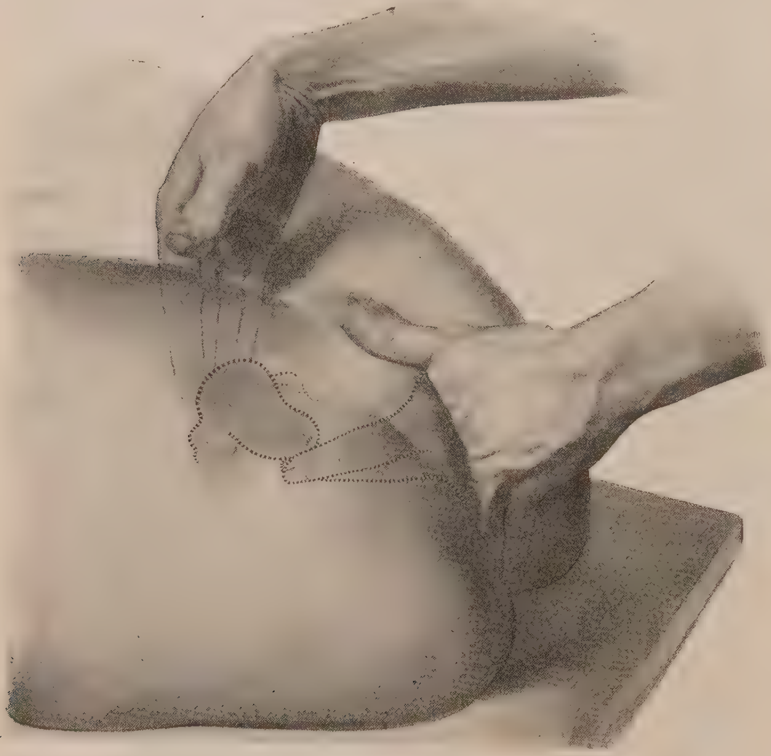


FIG. 55.—Bimanual Examination.

The examination of a young unmarried woman often presents a serious question. It should be avoided unless the symptoms indicate the existence of conditions which endanger her health. The regular occurrence of menstrual molimina without bloody discharge after an age when puberty should be expected must be considered an indication for physical examination. Where a digital examination is demanded and the hymen is unruptured, the finger can be inserted into the rectum. If a vaginal examination seems indispensable, the discomfort can be lessened by lubricating the examining finger carefully and directing the patient to bear down during its introduction..

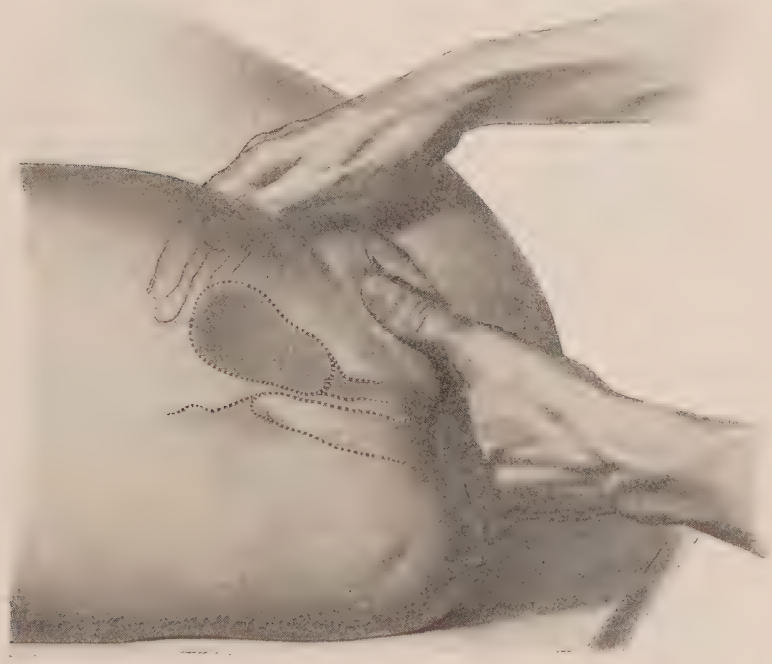


FIG. 56.—Recto-abdominal Palpation.

51. **Rectal touch** is known as the recto-abdominal, recto-vagino-abdominal, or recto-vesical touch. (Figs. 56, 57, and 58.) The routine practice of digital examination by the rectum in the first investigation of a patient is to be recommended. The finger should be washed carefully after its removal from the vagina and before its introduction into the rectum, and *vice versa*. Neglect of this precaution may cause a severe proctitis from the introduction of infectious material. The anointed finger, first directed forward, and after its entrance carried backward is gently rotated. The examiner is enabled to recognize the condition of the rectum, the presence of fissures, hemorrhoids, ulcerations, contractions of the sphincter, sensitiveness of the coccyx, encroach-

ment upon the bowel by the uterus, the condition of the posterior surface of the latter organ, the presence of inflammatory exudate in the pelvis, malignant infiltration of the broad ligaments or peritoneum, and the position of the uterus, when it is desired to avoid vaginal examination of a virgin.

The rectal procedure promotes replacement of a displaced uterus. The correction of malpositions is facilitated by the introduction of the middle finger into the rectum and of the index finger or thumb into the vagina. The conjoined rectal manipulation is known as the recto-abdominal, the recto-vagino-abdominal, or the recto-vesical, according to the position of the finger of the two hands. The absence or presence of the uterus in congenital atresia vaginalis may be determined by recto-vesical touch; that is, the introduction into the rectum of the finger and of a sound, bougie, catheter or finger of the other hand through the urethra. It is rarely necessary to explore the bladder with the finger. Simon introduced the whole hand into the bowel, thus securing additional

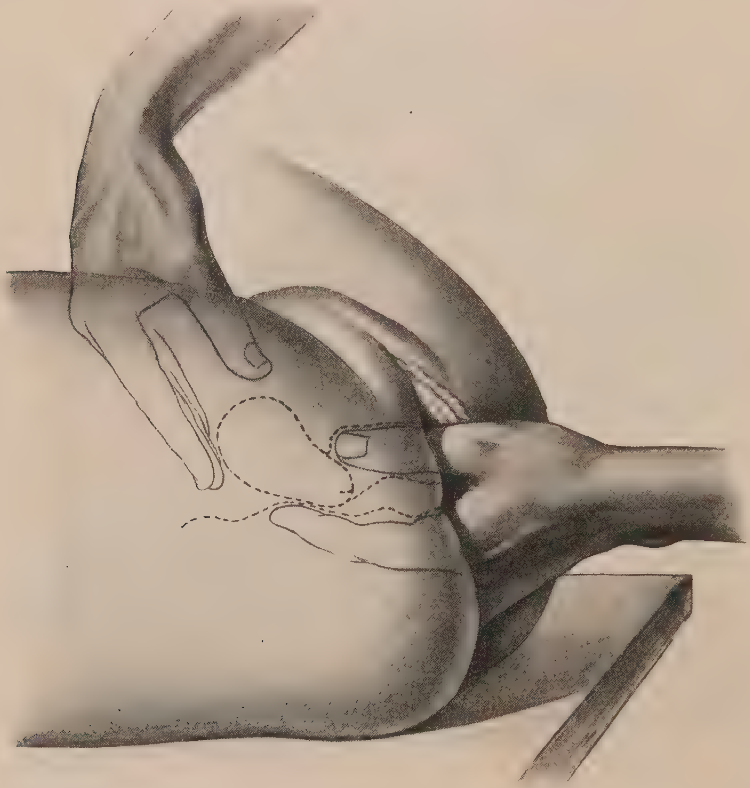


FIG. 57.—Recto-vagino-abdominal Palpation. Index-finger of one hand in the rectum, thumb in the vagina, and the fingers of the other hand over the abdomen.

information as to the condition of the pelvic organs. However, the serious injuries resulting from its practice render it an unjustifiable procedure unless the surgeon has an exceedingly small hand.

The rectal mucosa may be exposed by the insertion of one or two fingers into the vagina and pressing downward upon its posterior wall.

Ferguson advises exploration of the abdominal viscera through an incision in the posterior vaginal fornix as preferable to an exploratory abdominal incision. It is true that such an investigation can be made and that it avoids the prolonged convalescence from an external incision, yet its practice will often result in a weakened pelvic floor which will subsequently prove an ineffective barrier to vaginal hernia.

The subject of bimanual examination should not be dismissed without a word of caution. Severe pressure over the abdomen exaggerates any displacement and may cause one to be simulated which does not exist in ordinary conditions. It should always be exercised with care to avoid injury. Anxiety to arrive at a correct diagnosis may lead to rupture of a tubal collection or an ectopic gestation sac and necessitate prompt operation to save life. I have seen two patients and have been told of others in whom examination was followed by rupture of ectopic gestation sacs with death from internal hemorrhage.

DIAGNOSIS: INSTRUMENTAL EXAMINATION.

52. Instrumental Examination. In office practice the physician should have in a tray the following sterilized instruments: a large and small bivalve speculum, a Sims' speculum, a rectal speculum, long uterine dressing forceps, single and double tenacula, probes and applicators, sharp and dull curettes and scissors, angular and curved on the flat. The order recommended for instrumental examination formerly was, first, the use of the sound and then of the speculum. The difficulty,

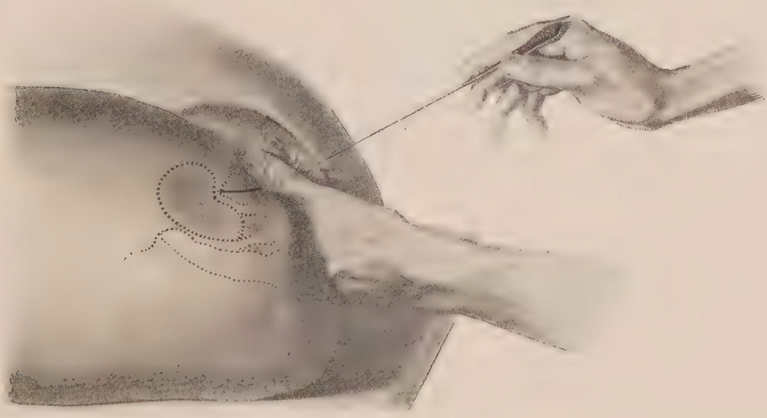


FIG. 58.—Rectovesical Palpation. Sound in Bladder.

however, in rendering the vagina sterile has led justly to the reverse procedure. The sound is a long, flexible instrument, 25 cm. in length, 2 or 3 mm. in diameter, terminating in a bulbous end. It generally has a slight elevation about 6 cm. from its end, which indicates the normal length of the uterine cavity. For convenience in measurement its posterior surface is marked by a scale in inches or centimeters. The instrument should be perfectly smooth, having no notches or indentations which may serve to retain infection. It is made of silver, or copper which has been silver or nickel plated, and should be sufficiently flexible to admit of its being readily bent. The handle should be roughened upon one side so that the concavity of the instrument can always be determined. Such an instrument is known as Simpson's sound. Sims advocated the use of a finer and more flexible instrument, known as the probe.

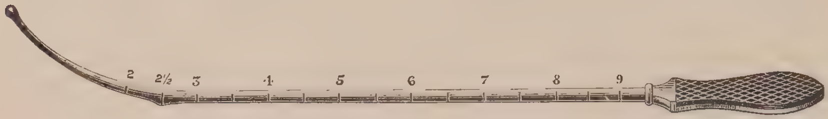


FIG. 59.—Simpson's Sound.

FIG. 60.—Sims' Probe.

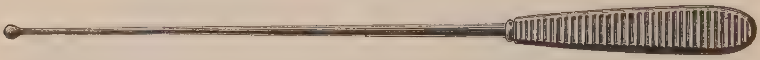


FIG. 61.—Whalebone Probe.

53. **Probes** are made of metal, hard rubber, and whalebone. The metal probe may be made of twisted steel and covered with a rubber sheath, rendering it more flexible. (Fig. 62.) The uses of the sound or probe are to ascertain the patency of the cervical canal, the depth of the uterus, its width or capacity, the thickness of its walls, the presence of intra-uterine tumors, the condition of the mucous membrane, the direction of the uterine canal, and the mobility of the uterus. In treatment it has been used to replace the displaced uterus. The experienced physician will be able to obtain much of this knowledge fully as effectually

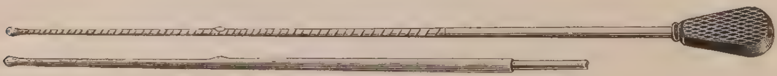


FIG. 62.—Spring Probe Covered with Rubber.

by the bimanual examination, and in the majority of cases the disadvantages of the instrument greatly outweigh the value of the information obtained by its use. It affords knowledge as to the patency of the canal which can not otherwise be determined; in all other instances the omission of its use is preferable to its employment. It is true it is capable of affording information as to the direction of the uterus when the situation of that organ is rendered doubtful by the presence of inflammatory exudate, but in such cases its use is contraindicated. Our inability to secure an aseptic vagina should lead to the introduction of the instrument through the speculum, and then only after the vault of the vagina has been carefully mopped with absorbent cotton wet with a 2 per cent. solution of formalin. It is almost impossible to introduce the instrument without injuring the mucous membrane of the uterine cavity, an injury which will afford a favorable culture field for the development of germs which are found in the vagina, or, exceptionally, even in the cervical canal. Such injuries explain the inflammatory irritation following the use of the sound and still further demonstrate the wisdom of discontinuing its employment for replacement of the uterus. When it seems desirable to use the sound without the speculum, the vagina should be scrubbed previously and two fingers introduced to the cervix, by which the sound is guided into the os. (Fig. 63.) No force should be employed and the

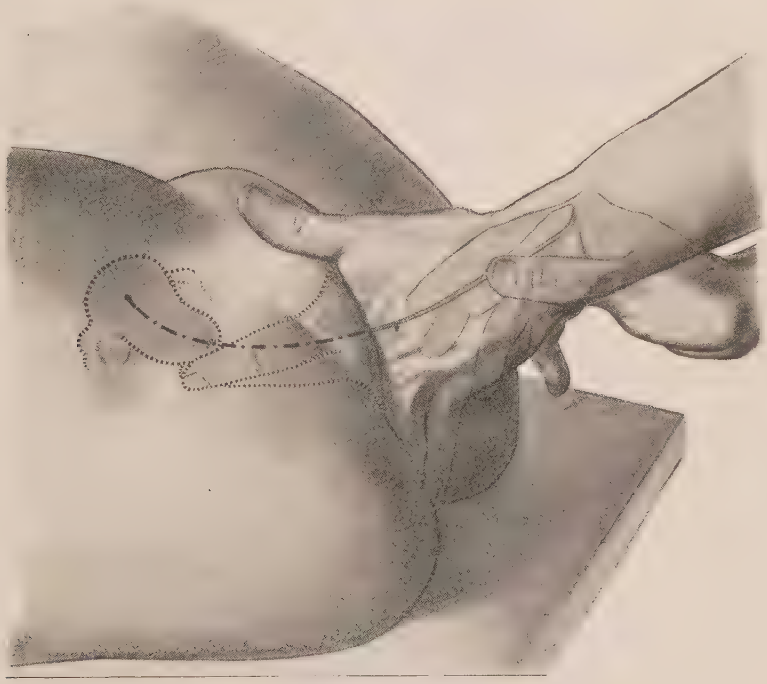


FIG. 63.—Introduction of the Sound.

instrument should have such a curve as will permit it to pass readily in the direction which a bimanual examination has demonstrated to be that of the uterine cavity. The date of the last menstruation must be known, and the use of the instrument should be avoided when there is the slighest suspicion of pregnancy. It should not be employed in the presence of acute inflammation or when inflammatory exudate or old infiltrations can be determined. Its employment in a case of malignant disease may lead to dangerous hemorrhage. In the uterus softened and rendered friable by inflammation the sound may penetrate its wall and enter the abdominal cavity. This accident produces no inconvenience unless the instrument carries infection. The sound may also pass into a Fallopian tube. This is more likely to occur in a bicornate uterus. The instrument should be scrupulously clean, indeed, should be sterilized by boiling, or when this is inconvenient be removed from a 5 per cent. solution of carbolic acid prior to its use. After its use the instrument should be sterilized by heat.

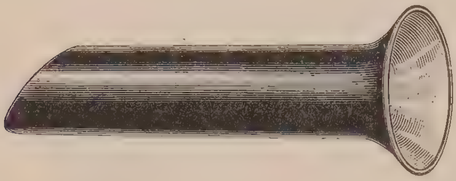


Fig. 64.—Ferguson's Speculum.

54. Specula. A patient placed in the dorsal position, with the limbs separated, reveals the mons veneris, with the larger labia. The latter are separated by a cleft or slit—the rima pudendum. Frequently the labia minora are elongated, and they, with the clitoris, are prominent. The posterior commissure may have been injured, and, instead of a slit, we will have a triangular opening, through the posterior part of which projects the vaginal wall. In lacerations of the pelvic floor its posterior segment may be drawn back, permitting one or two inches of the vagina to be inspected. Frequently by hooking back the vagina with two fingers the cervix can be seen. The necessity for satisfactory inspection of the uterus led to the invention of a great variety of instruments for this purpose, but all may be classed in two divisions: the tubular and the valvular speculum.

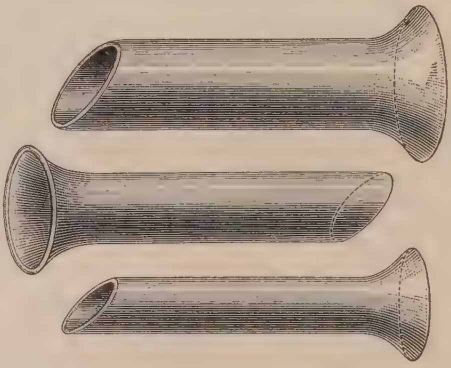


Fig. 65.—Milk-glass Specula.

The tubular speculum known as the Ferguson speculum may be made of glass, wood, rubber, celluloid or metal. The instrument is cylindric, the external end with a flange, the internal end beveled. It has one long side. (Fig. 64.) Glass instruments may be made of milk glass as the German speculum, or covered with quicksilver under a coating of pitch or rubber. (Fig. 65.) Such specula can not be sterilized by heat; glass is brittle, easily broken, and useless subsequently. They are very serviceable in making applications to the cervix, but only the wooden instruments are of value in use of the actual cautery. The application of medicaments to the uterine canal or the use of the sound through it are to be condemned. The tubular speculum is not self-retaining. Its range of application is so limited that it is seldom used now. To introduce this instrument the physician separates the labia with the left hand and holds the speculum with the right thumb and middle finger on either side and the index-finger on its upper surface. The longer side is placed against the posterior commissure of the vulva, which is depressed, and the speculum is pushed upward and backward, at the same time rotating the instrument so that its shorter side does not impinge against the tender anterior structures. The situation of the cervix has been previously located by the touch. If the cervix is not brought at once into the field of the speculum, it can be exposed usually by rotating the instrument When this procedure fails, it may be drawn into the field by a tenaculum.

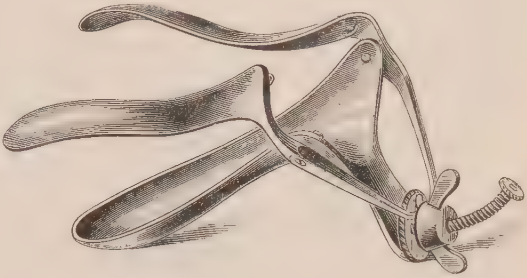


FIG. 66.—Nott's Speculum.

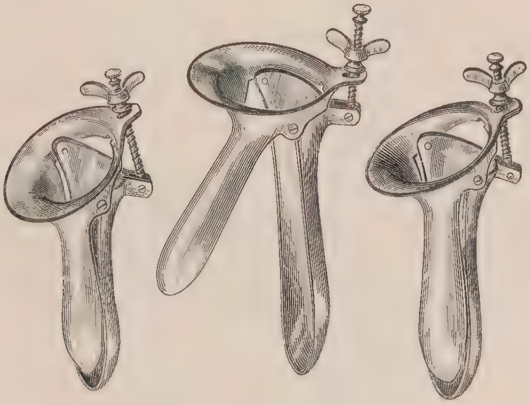


FIG. 67.—Higbee's Specula (three sizes).

If the cervix is large, only a part of it can be exposed at one time, and consequently a distorted idea of the condition is frequently obtained.

The valvular speculum may have one or more valves, and is called univalve, bivalve, trivalve, or quadrivalve according to the number of its blades. These specula afford a much better exposure. Those with more than one blade are self-retaining, therefore they have largely supplanted the tubular intrument. The quadrivalve instrument is now rarely used, as it affords but slight additional advantage over the bivalve. Besides it is difficult to keep clean. The Nott (Fig. 66) and Nelson specula have three blades and afford an opportunity to inspect the anterior vaginal wall. The bivalve speculum is the most satisfactory for general use. Of the great variety of specula, Higbee's (three sizes) (Fig. 67), Talley's (Fig. 68), and Goodell's (Fig. 69) are probably the most satisfactory. The blade should be from 7.5 to 11 cm. in length. When the vaginal portion of the cervix is short, the Higbee speculum, which has a long posterior blade, will not expose the os. In such cases the Goodell or Talley specula, with blades of equal length, are better. The speculum is introduced by separating the vulva with the fingers of the left hand, while the instrument, held in the right, is introduced with its transverse diameter parallel to the long diameter of the vulva. As the widest diameter of the vagina is at right angles to that of the vulva, the instrument is rotated and carried upward, directing the blades behind the cervix, the position of which has been previously determined by a digital examination. As the blades are separated the cervix is generally exposed. In marked anteversion it may be necessary to use a tenaculum to bring the cervix into view. The speculum is a therapeutic instrument, although it confirms the diagnosis which has been made by digital examination.

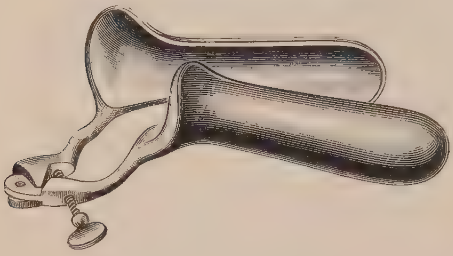


FIG. 68.—Talley's Speculum.

The univalve or duck-bill speculum, introduced by Sims, is used with the patient in the semiprone position. (Fig. 70.) The instrument has two blades at either end of a handle, which are about 10 cm. long, the smaller blade being 1.5 cm. and the large blade 4 cm. in width. To introduce this instrument the physician raises the buttock, passes the blade with its width parallel to the vulva, and after its entrance rotates it with the handle directed backward. The assistant then holds the other blade with the right hand, using the instrument as a retractor. (Fig. 71.) His elbow is held against his hip, while the left arm rests upon the patient, the hand elevating the buttock. Care must be exercised to follow the curve of the sacrum or the instrument will slip out. As the perineum is drawn back the vagina is ballooned by the atmospheric pressure and the cervix and upper vagina are exposed. When the vagina is large, with relaxed walls, the cervix may be obscured

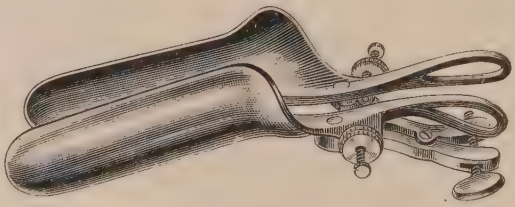


FIG. 69.—Goodell's Speculum.

from view. The depressor (Fig. 72) to push back the anterior wall or a tenaculum (Fig. 73) hooked into the cervix will overcome the difficulty. The univalve speculum affords a better exposure of the cervix and upper portion of the vagina than any other form of instrument. Its particular disadvantage is that it is not self-retaining, and in office practice requires the asistance of a nurse. Various devices (Fig. 74) have been instituted to render it self-retaining, but they require considerable time for their use. In operating with the patient in the semiprone position, the irrigating fluid and blood run forward between the patient's limbs, and hence render it difficult to keep her person and clothing clean. The Sims speculum can be used with the patient in the lithotomy position, but it is uncomfortable to hold. The Simon posterior and side retractors serve a similar purpose. (Fig. 75.) The perineal

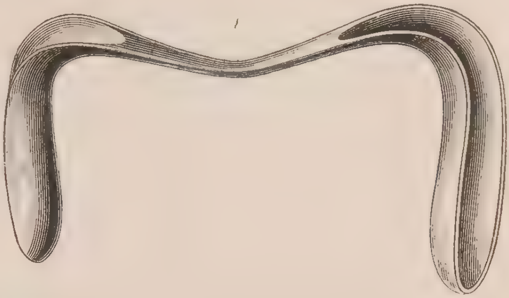


Fig. 70.—Sims' Speculum.

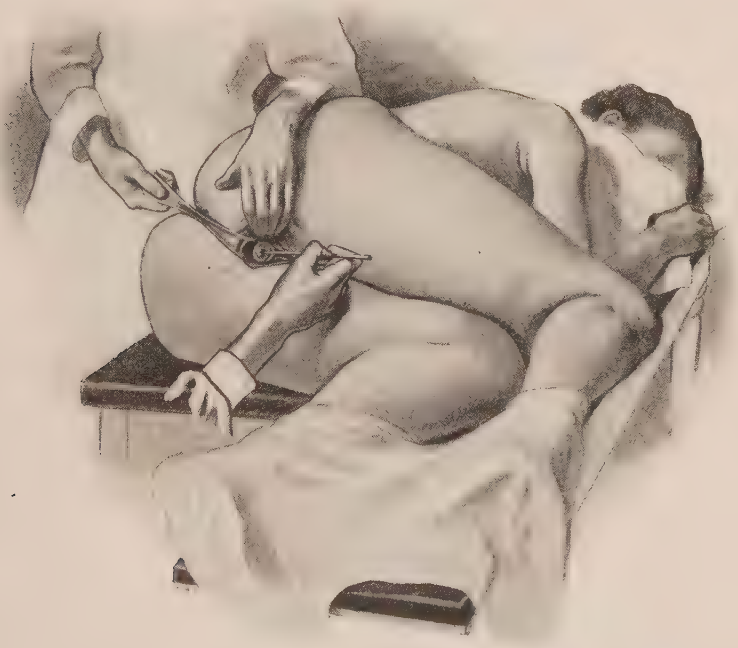


Fig. 71.—Proper Method of Holding Sims' Speculum. The cervix brought into view with the tenaculum.

retractor known as the Edebohls speculum (Fig. 76) is the most satisfactory. With the patient upon her back, and the limbs acutely flexed, the perineum is retracted and held back by a weight attached to the instrument. (Fig. 77.) The cervix and the upper and anterior vagina are thus exposed to manipulation.

55. Uterine Fixation and Downward Traction. Reference has already been made to the use of the tenaculum to bring the cervix into the field of the speculum. The same instruments, or, better, a double tenaculum known as bullet-forceps (Fig. 78), guided to the cervix by the finger, may be used to fix the organ, or in some cases to exert traction upon it during digital examination. (Fig. 79.) Such a procedure enables us to examine through the rectum the whole posterior surface of the uterus and even to pass the finger over its fundus. It is utilized in replacing the retroverted and retroflexed organ and in differential diagnosis of abdominal and pelvic growths.

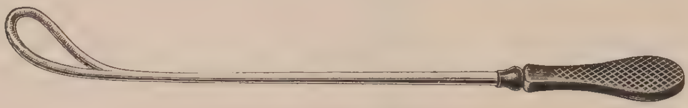


FIG. 72.—Sims' Depressor.

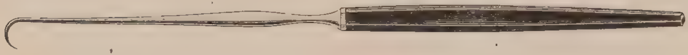


FIG. 73.—Goodell's Tenaculum.

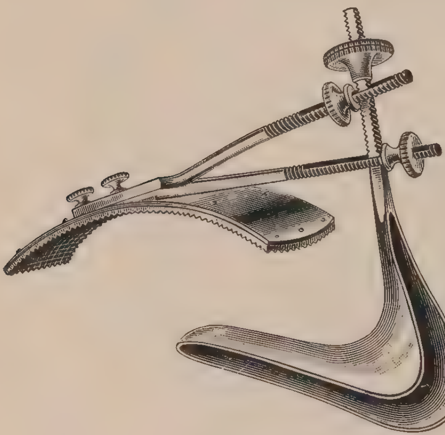


FIG. 74.—Self-retaining Sims' Speculum.

56. Dilatation of the Uterus. It is frequently necessary to explore the cavity of the uterus, either to complete the diagnosis of a condition rendered probable by other procedures or as a preliminary to an operation.

The method of operation may be divided into two classes: the first is bloodless and includes the use of tents, divulsion, and gradual dilatation; the second, incision of the external os and bilateral incision of the cervix. Before practising any of these procedures the presence of inflammation in the organ or vestiges of inflammatory exudate about it should be excluded. The existence of such conditions presents an element of serious danger.

Dilatation by Tents. Formerly the use of tents was a popular and general method of dilatation. The materials used for this purpose were sponge, laminaria, tupelo, slippery elm, decalcified ivory, and gentian root. The sponge has the greatest dilating power, but is the most difficult to render aseptic and to maintain in that condition. The frequent unfortunate sequelæ that followed their use have led largely to their discontinuance. The laminaria (Fig. 80) and tupelo tents are the most used. The former may be introduced in nests. Their dilating power is enhanced by having them hollow. A number of small ones to fill up the canal is to be preferred to one large tent. They may be rendered aseptic by subjection to a dry heat of 250° F. The tent should be placed in an envelope before its introduction into the sterilizer, and

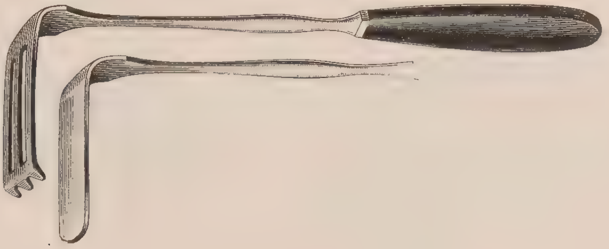


FIG. 75.—Simon's Retractors.

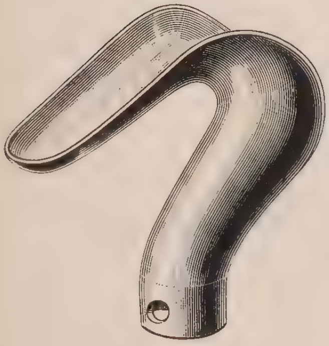


FIG. 76.—Edebohls' Speculum.

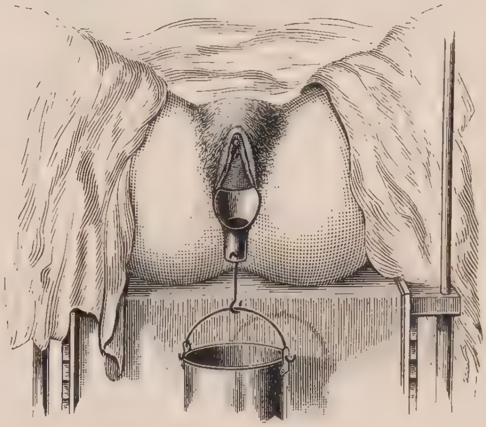


FIG. 77.—Edebohls' Speculum in Position.

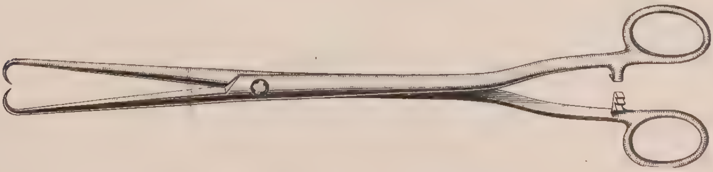


FIG. 78.—Double Tenaculum Forceps.

the envelope should be broken only when it is to be used. The tents may also be rendered safe by immersion prior to their use in a saturated solution of iodoform in ether. Pozzi advocates their immersion in equal parts of carbolic acid and alcohol. They may be placed in 95 per cent. carbolic acid for a few minutes and afterwards washed in alcohol before insertion. I prefer immersing the laminaria tent in tincture of iodin for a few minutes before it is employed. The vagina and cervix should be cleansed carefully with an antiseptic solution; the cervix is seized through the speculum with bullet forceps, while the tents are held in dressing forceps, and introduced, one after another, until the canal is filled. (Fig. 81.) Care must be exercised to mold the tents to the curve of the canal, and no force should be employed in their introduction. The tents should project from the external os, and should be held in place by a tampon of iodoform gauze. They should be removed at the end of ten or twelve hours, although they may be permitted to remain twenty-

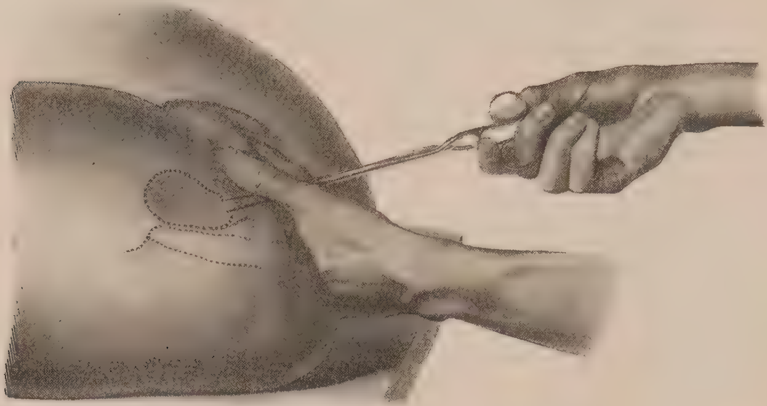


FIG. 79.—Traction upon Uterus with Double Tenaculum during Digital Examination by the Rectum.

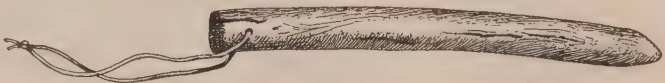


FIG. 80.—Hollow Laminaria Tent.

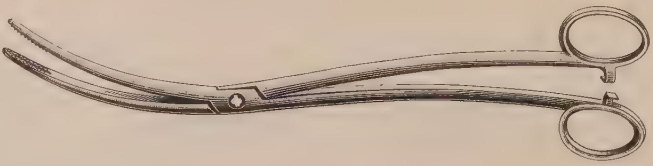


FIG. 81.—Uterine Forceps—Dressing.

four hours. They are removed by pulling upon a string fastened to the end of the tent. Removal is sometimes rendered difficult by irregular dilatation; the internal os, being more resistant, causes an hour-glass-shaped distention. (Fig. 82.) The tent is removed by placing the finger against the cervix during traction. The irregular dilatation is less likely to occur with a tupelo tent, though its dilating power is not so great. Pain during the dilatation can be relieved by the use of from 2 to 5 grains of acetanilid or from 1/4 to 1/2 of a grain of codein. The removal of the tent should be followed by careful antiseptic irrigation, after which another tent or series of tents may be introduced. The use of the tent affords an opportunity to make a digital exploration of the uterine cavity, and is of advantage in small submucous fibroids, in suspected epithelioma, and in retained products after abortion.

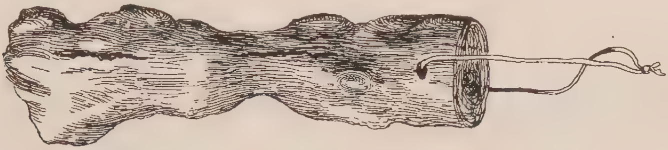


FIG. 82.—Dilated Tent Showing Constriction from Internal Os.

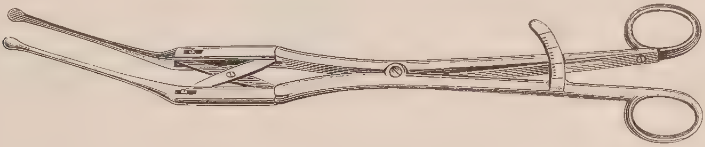


FIG. 83.—Ellinger's Dilator.

Divulsion consists in the rapid dilatation of the uterine canal by the various dilating instruments. The preferable instruments are the parallel bar dilators, such as the Ellinger (Fig. 83), with the Baer and Goodell modifications (Fig. 84); the latter, with its roughened blades, is a powerful instrument. The vagina and cervical canal are carefully cleansed, and through the speculum the cervix is seized with a double tenaculum and stretched with small dilators, and subsequently with the large instrument to the extent of 2 or 3 cm., if desired. The principal objection to the

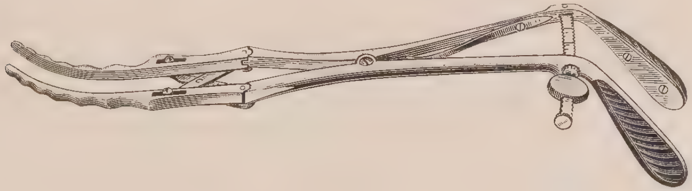


FIG. 84.—Goodell's Modification of Ellinger's Dilator.

procedure is that the pressure is confined to the lateral surfaces of the cervix and, therefore, may lead to laceration.

Gradual dilatation is accomplished by the use of graduated bougies, made of steel or hard rubber. The former are preferable, as they can be sterilized by heat. The Pratt series of bougies, which have two bougies to each handle, making eighteen in the set, the maximum being No. 51, will be useful. (Fig. 85.) Each bougie is 2 mm. larger than the preceding. After thoroughly cleansing the vagina and cervix the Edebohls, speculum is introduced, the cervix is seized with vulsellum or, better, two double tenacula and the bougies are used one after another, up to the largest size. (Fig. 86.) Care should be exercised not to puncture the uterine wall. This accident is more likely to occur in acute flexions; or where the wall has been softened by acute inflammation or recent pregnancy. The point of the instrument makes so much pressure upon the thin convex wall near the flexion that finally it ruptures. Rupture or perforation of the uterine wall is not of infrequent occurrence, and when done by the bougie has little significance. The tear by the parallel bar dilators is more serious, as the wall of the uterus is torn as wide as the dilators have separated. Through such an opening, omentum or a knuckle of intestine may be drawn into the uterine cavity. It is sometimes advised to precede this method by the use of a tent, but this does not seem necessary. The dilatation can be accomplished by the bougies in shorter time than by divulsion.

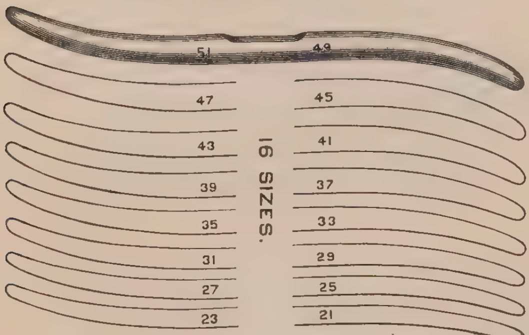


FIG. 85.—Pratt's Dilators.

Dilatation by Gauze Packing. Vulliet has devised a procedure for prolonged dilatation, which he denominates a "method of dilatation by progressive plugging." It consists in repeated plugging of the cervical canal with medicated gauze. After the uterus has been carefully cleansed, strips of gauze are packed into the cervical canal until it is completely filled. These are permitted to remain for forty-eight hours, when they are removed. If the uterus is not then dilated sufficiently to admit the finger, the cavity is again cleansed and packed. Pieces of compressed sponge have been used for a similar purpose, and, from their increase in size under moisture, are probably more effective. The only source of anxiety is the uncertainty as to their being absolutely sterile. This plan of procedure may be carried over a series of days or weeks, without inflammatory reaction. It is, however, not effective in cases of rigid cervix, and the same purposes may be accomplished by a more rapid dilatation.

Incision of the Cervix. The external os, when very rigid, or when the cervical canal is partly dilated by an extruding fibroid, may be incised. This procedure may be resorted to for abortion in the absence of proper dilating instruments. An incision from 1 cm. to 1.5 cm. should be made with scissors upon either side. As the ordinary scissors slip off, the Kuchenmeister scissors (Fig. 87) are more effective. The procedure is most readily accomplished by grasping each lip with a double tenaculum and incising on either side with a knife. The operation completed, the incised cervix should be closed with sutures.

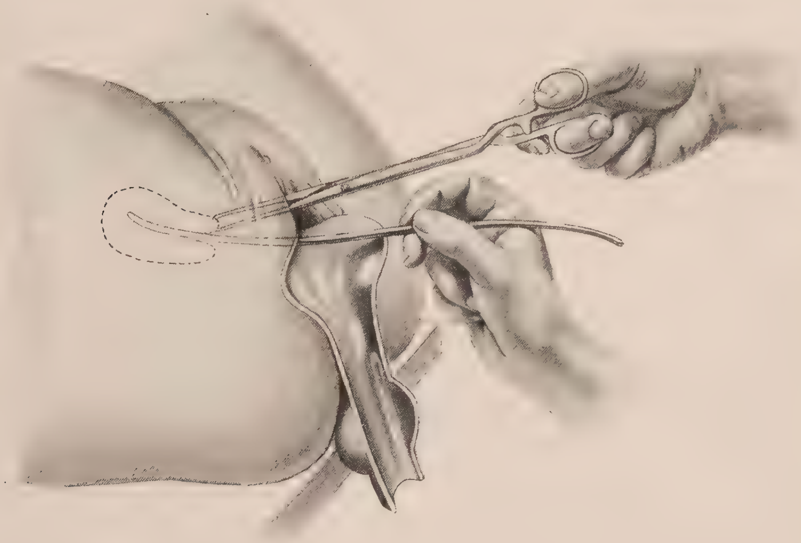


FIG. 86.—The Method of Dilatation with the Graduated Bougies.

Complete bilateral incision of the cervix is rarely indicated, as other measures are less severe. The operation may be supplemented, if necessary, by ligation of the uterine arteries. The vessels may be secured by drawing the cervix to one side and passing a ligature with a strongly curved needle. Care should be exercised to keep close to the uterus and not to carry the ligature forward of a line tangent to the

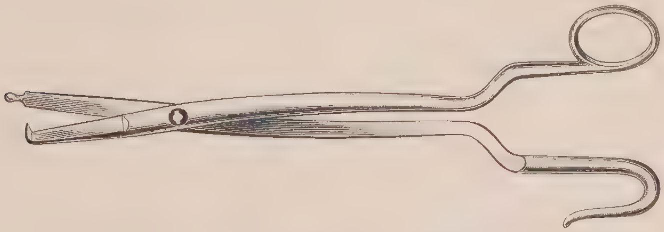


FIG. 87.—Kuchenmeister's Scissors.

anterior circumference of the cervix, in order to avoid ligation of the ureter. A second ligature is passed upon the opposite side, when the cervix can be incised with a knife to the vaginal fornix on either side without danger of hemorrhage. Although generally advised that ligation should precede incision, it is not necessary. Hemorrhage does not always occur. When it does, the bleeding vessels can be seized with forceps and then ligated. If the finger cannot be passed through the internal os, the canal can be still enlarged further with a probe-pointed bistoury. After exploration or operative procedure the cervix should be sutured carefully. Lateral ligatures should be removed in two or three hours, or in a shorter time if there is any reason to fear that the ureter has been ligated. Prolonged retention of the ligatures would result in sloughing of the vagina.

EXPLORATION OF THE URETHRA, BLADDER, AND URETERS.

57. **The bladder** can be explored by the introduction of the finger through the urethra, but the dilatation required is so great that, notwithstanding every precaution which can be exercised, the procedure is often followed by loss of sphincter control. A careful urethral and vesical examination may be made desirable by frequent and painful micturition; by admixture with the urine of blood, pus, desquamated epithelium, fragments of tissue; and the presence of bacteria. Limitation of the inflammation to the urethra is indicated by a pain and burning during the act of urination, followed by comparative comfort (unless complicated by cystitis) unaccompanied by frequency of micturition. Inspection will reveal the orifice of the inflamed urethra as red, pouting, and angry. Frequently by pressure along the course of the canal from above downward a drop or two of dirty or purulent fluid will be expressed. When the inflammation involves the wall of the urethra, it can be distinguished readily as a distinct cord-like projection on palpation of the anterior vaginal wall. Skene's urethral endoscope is of value in determining the condition of the urethral mucous membrane. (Fig. 88.) It discloses points of inflammatory redness, desquamated epithe lium, thickened membrane, and fissures of the internal urethral orifice. The instrument should not be unduly large, as the distention of the urethra obscures pathologic alterations. Irritation and inflammation of the bladder is indicated by frequent and painful micturition and violent tenesmus unrelieved by urination. The attacks may recur and appear to be induced by exposure to colds, as drafts, changes of temperature, dampness, indiscretions in diet and drinking, and by excessive venery. The discomfort may be more or less continuous. The distressing symptoms may have arisen from infection which has reached the

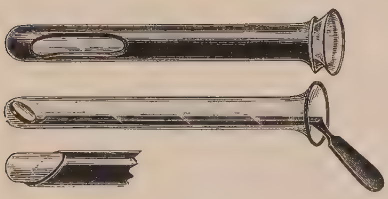


FIG. 88.—Skene's Urethroscope.

bladder from the urethra, or the kidney through the vesical walls; or from the presence of foreign bodies, as calculi, fragments of catheter, or extraneous bodies which have been inserted into the urethra in the process of onanism. The existence of the various neoplasms may be manifested by similar symptoms. Inflammation of one or both ureters is apt to be associated with pain, which may be referred to the bladder. Incontinence of urine associated with a forcible dejection of the fluid in small quantities is especially characteristic of inflammation of the ureter. Examination of the urine is of particular value in the determination of the lesions of the various portions of the urinary tract. In urethritis and functional irritation of the bladder, the urine will be clear and free from deposits. In cystitis, ureteritis, and pyelitis the urine may be loaded with sediment, which, under the microscope, will be found to consist of blood and pus corpuscles, renal and vesical epithelium, portions of tissue, crystals of the various salts, and in some cases casts of the uriniferous tubules. The determination of the portion affected by the character of the desquamated epithelium is impracticable. The examination of urine secured after careful irrigation of the bladder, or, better still, after the catheterization of the ureters, not only differentiates renal from vesical conditions, but affords information as to the state of the individual kidney. If after irrigation of the bladder the urine secured is clear and comparatively free from sediment, it is a fair inference that the disorder is confined to the bladder; and, on the contrary, the continuation of pus blood, and desquamated epithelium in the urine is an intimation that the upper urinary structures are the seat of disease or are actively involved by it. Inflammation of the bladder causes the secretion of a large quantity of mucus, and the urine contains but little albumin, while in inflammation of the pelvis of the kidney the proportion of albumin is comparatively large. Pyelitis is distinguished from nephritis by the absence of tubular casts. Bloody or highly colored urine is not uncommon in acute inflammation of the kidney or bladder. Hemorrhage from the urinary tract may occur from a variety of causes and from any portion of the tract. From the urethra it may occur independently

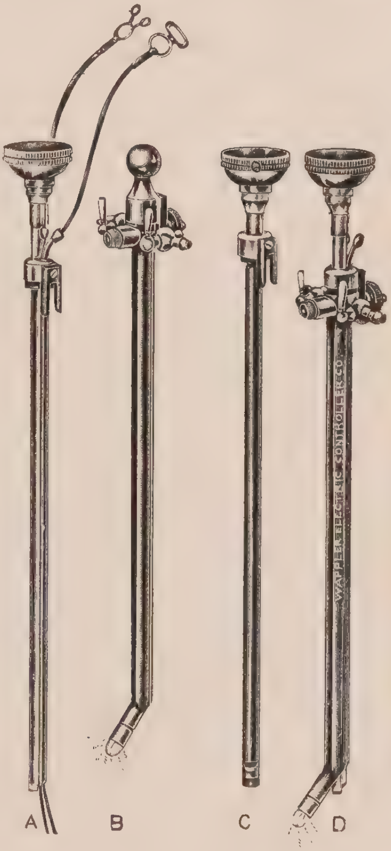


FIG. 89.—Cystoscopes.

of urination as a few drops or clots in the first discharge of urine, or after the completion of micturition. Vesical hemorrhage may cause the urine to be bright red or appear as almost pure blood, according to the severity of the hemorrhage. When very profuse, the bladder may become filled with clot, so that the patient is unable to void urine, and the presence of the clot interferes with catheterization. Free bleeding from the kidney may be seen with the cystoscope (see Fig. 89), and makes its exit from one of the ureters as pure blood. Distinct casts of the ureter may be found in the urine, when the patient gives a history of severe pain over the kidney and along the ureter corresponding to the side from which the hemorrhage has occurred. Pain is a characteristic symptom. It is felt above the symphysis in cystitis, along the affected ureter in ureteritis, or over the affected kidney in pyelitis, or where the kidney contains a calculus. The hypogastric region is tender to pressure in cystitis. The tenderness is more noticeable upon sudden withdrawal of the hand after deep pressure when tubercular cystitis exists. The bladder may be palpated by one or two fingers in the vagina and the hand over the abdomen. An inflamed bladder will be thickened, contracted, and very tender. Calculi and neoplasms may thus be recognized. The inflamed and thickened ureter is easily recognized upon one side or upon both sides when bilateral. The shortened ureters stand out as firm, dense cords. Not infrequently in such cases the pressure along the ureter may cause a sudden discharge of urine, which may be projected against the person of the investigator.

An inflamed kidney is readily palpated when the patient assumes the dorsal position with the limbs flexed. The physician stands upon the affected side, places one hand upon the back beneath the ribs, and pushes gently forward, while at the same time the patient is asked to take a long breath and allow it to be expelled quickly. Pressing the thumb of the hand beneath the ribs in front during expiration the enlarged kidney may be felt to have slipped upward, or, where it is quite movable, may be held below the fingers. In thin patients the kidney thus may be distinguished easily. Care must be exercised, however, that a prolapsed or malformed liver is not mistaken for the kidney. In July, 1906, I saw a woman who, I was convinced after an examination under an anesthetic, had a very movable kidney. Examination through an abdominal incision, which was made for shortening the round ligaments, revealed the fact that the supposed movable kidney was a tongue-like projection from the anterior margin of the liver which, through the abdominal wall, greatly resembled the kidney in size and shape.

Pawlik and Kelly devised specula through which the bladder may be inspected and medications applied to the most affected portion. The orifices of the ureters may be inspected and the ureteral catheter employed. These specula require the urethra to be dilated, sometimes close to or beyond the limit of safety, in order to afford opportunity to inspect and treat the affected structures properly. Of late years the procedure of Nitze renders the investigation more satisfactory. By this, the illuminating lamp is introduced within the bladder and its effectiveness is increased by magnifying the image. The bladder is distended with water or air, preferably the former, when the entire cavity may be carefully inspected. The electric illumination can be obtained through a transmitter from the street current or the dry cell battery may be employed.

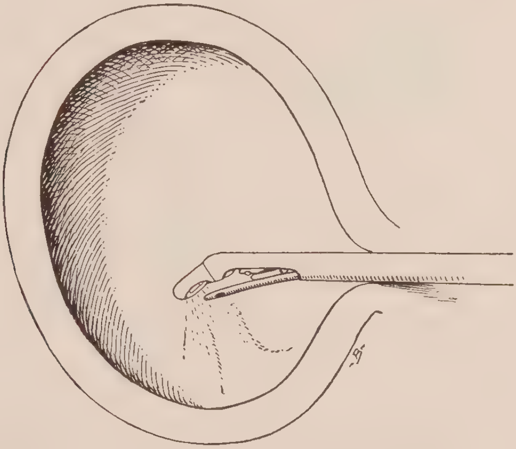


FIG. 90.—Cystoscopic Investigation of the Bladder.

An instrument not larger than a No. 30 bougie, French scale, is sufficient for every purpose in the inspection of the bladder and catheterization of the ureter. Such an instrument may be employed without an anesthetic; the bladder may be irrigated and filled through the tube, after which its escape is perfected by the introduction of a magnifying lens. The cystoscopic inspection is of value, as it discloses the condition of the vesical mucous membrane, permits the differentiation of desquamation and

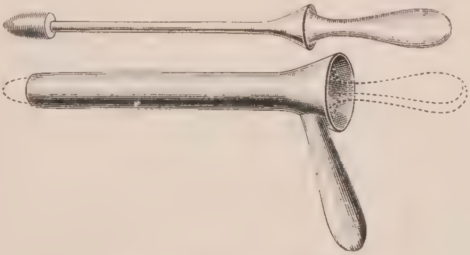


FIG. 91.—Kelly's Specula (Urethra).

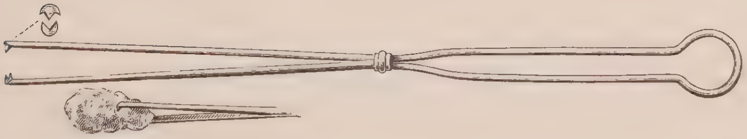


FIG. 92.—Mouse-tooth Forceps for Cotton Pleegets.

catarrh from gonorrheal and tubercular cystitis, and has demonstrated the dependence of obstinate cystitis upon torpid ulceration of the vesical mucous membrane. It permits the inspection of the inflamed, pouting orifices of the ureters and allows the determination of the affected kidney by the observation of blood or pus coming from the orifices of the corresponding ureter. It has permitted the recognition and dislodgment of calculi situated in the lower end of the ureter. The condition of the ureter and kidney is also determined by passing through the posterior slit of the cystoscope a long, soft, ureteral catheter. This procedure permits the exploration of the ureter and the accumulation of the urine for examination, affording an opportunity to determine whether one or

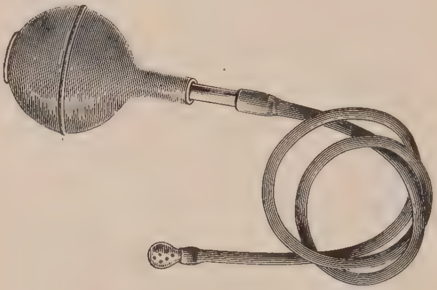
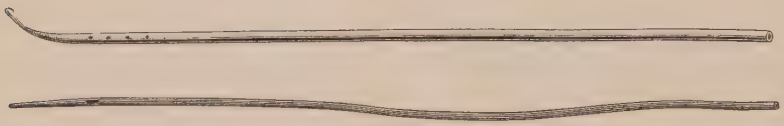


Fig. 93.—Kelly's Evacuator.



Figs. 94 and 95.—Ureteral Catheters, Metal and Soft.

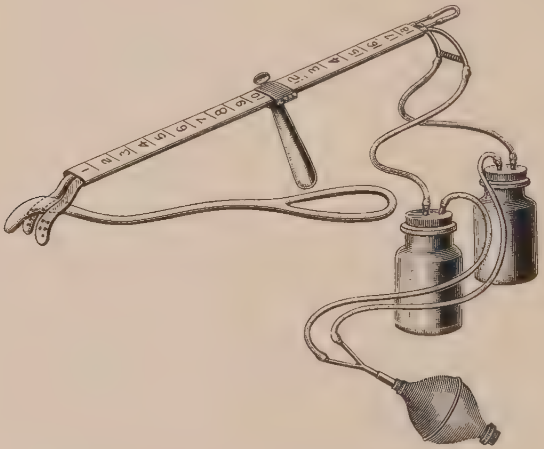


Fig. 96.—Harris' Double Catheter for Obtaining Urine from Kidneys Separately.

both kidneys are involved. By a wax-tipped bougie, as suggested by Kelly, the presence of a calculus can be recognized in the ureter or in the pelvis of the kidney.

The urine should be drawn and examined carefully before the cystoscopic investigation is made. The segregator, as devised by Harris, of Chicago, will permit the accumulation of the urine from the kidneys in separate receptacles, but it is inferior to the use of the urethral catheter, through the cystoscope.

DIAGNOSIS: EXPLORATORY OPERATIONS.

58. Exploratory operations for the purpose of diagnosis may be one of the two classes: puncture and incision. Puncture is divided into two procedures; tapping and aspiration. The former is applicable to the diagnosis and treatment of ascites; the latter, where it is desirable to lessen the size or to determine the contents of a cyst.

Tapping, or paracentesis abdominis, was at one time the only method of treating abdominal collections of fluid, whether free or confined within a cyst. The instruments used should consist of a trocar and cannula, about 1/8 of an inch in diameter, to which a rubber tube may be attached. If Wells' blunt cannula is used, a bistoury must be employed to make the incision. The patient is placed upon her side near the edge of the bed; a point is selected in the median line, about midway between umbilicus and symphysis, which percussion has demonstrated to be free from intestine. The surface is frozen by the application of ice and salt, or a spray of ethyl chlorid. The procedure can be rendered painless far more effectually by infiltrating the skin with Schleich's fluid introduced by a hypodermic syringe. An incision is made through the skin, and the trocar is plunged, by a quick, rotating thurst, into the peritoneal cavity. The finger is held upon the instrument to govern the distance it is to be introduced. The trocar is withdrawn and a rubber tube is applied to the cannula to convey the fluid into a receptacle. The complete evacuation of the fluid is secured by pressing upon the abdomen toward the cannula. Arrest of the flow by the intestines floating against the end of the cannula can be obviated by changing its position. As the contents are evacuated the entrance of air into the abdomen may be prevented by keeping the end of the rubber tube submerged. The cannula is withdrawn and a piece of aseptic gauze is placed over the opening and held by a small strip of plaster. The withdrawal of a large quantity of liquid is frequently followed by symptoms of syncope. The patient should be kept in the horizontal position and, if necessary, given per oram well diluted whisky or brandy (f℥j), spt. ammon. aromat, fʒj, strychnin sulphate

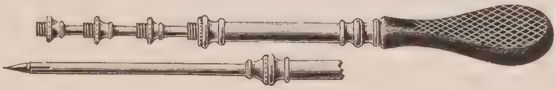


FIG. 97.—Nest of Trocars.

(gr. 1/60 to 1/30), atropin sulphate (gr. 1/100), hypodermically, hypodermic injections of an aseptic ergot, or inhalations of a few drops of amyl nitrite.

Aspiration should be the procedure chosen when it is desired to evacuate the contents of a cyst. The use of the trocar favors the entrance of air and pathogenic germs. Its opening permits the escape of the cyst-contents into the peritoneal cavity, which not infrequently promotes the development of peritonitis. Consequently the contents of a cyst should be removed entirely if the wall has been perforated. The use of the hypodermic syringe for the withdrawal of a small quantity of fluid for examination is reprehensible. The patient encounters a greater risk from the escape of a portion of the contents of a tense cyst through even a small opening than can be compensated by any advantage derived from an examination of the fluid. For aspiration two instruments may be used. One in which the needle is connected with the reservoir will hold a few ounces, the other, used in large accumulations, consists of a large air-pump connected by tubing with a needle, a quart bottle intervening. (Fig. 98.) Rapid suction exhausts the air in the bottle and causes the fluid to run until the cyst is emptied or the bottle filled. Strong suction, when the cyst is nearly empty, draws its sides into the needle and stops the flow. Withdrawal of the contents of the cyst is an advisable procedure when the pressure of the tumor is so great as to obstruct circulation and lead to dyspnea, decreased renal secretion, and more or less anasarca. Operation in such cases, by facilitating the restoration of secretion, promotes a favorable result in subsequent removal of the cyst. The procedure may be necessary, also, to prolong the life of the patient until a skilled operator can be secured. *Broad-ligament cysts* are occasionally cured by aspiration. This affords an opportunity to clear up the diagnosis in otherwise obscure cases. Two conditions particularly can be determined by microscopic examination of the fluids. *Hydatid disease* is recognized by finding even a single hooklet. *Malignant disease* is determined by the presence of blood-corpuscles or particles of malignant tissue. Blood is mixed with the fluid. To examine the fluid it should be drawn into a clean vessel, covered, and permitted to stand for twelve hours, when blood-corpuscles will be found at the bottom or adherent to the sides of the vessel. Tapping and aspiration should always be done through the abdominal walls, never through the vagina or rectum, on account of the difficult antisepsis and consequent danger of infection.

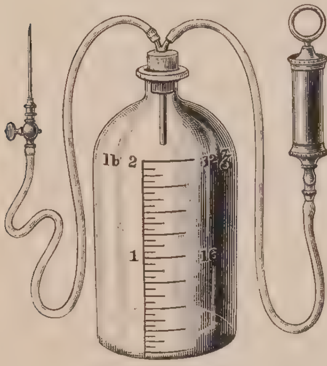


Fig. 98.—Aspirator.

Exploratory incision in cases of difficult or doubtful diagnosis is a most effective method for making known the condition, but should be infrequently practised. The more carefully the sense of touch is cultivated, the less frequently will an incision be required. The position of a patient who has nerved herself to undergo an abdominal operation, only to ascertain that her trial and suffering have been without avail, is most distressing. It is not calculated to lead the surgeon to repeat it frequently in cases of extremely doubtful character.

DIAGNOSIS: MICROSCOPIC EXAMINATION.

59. Microscopic Examination. It is evident from the preceding that careful investigation of tissue changes is often necessary to confirm and add to the data secured by inspection and touch. The microscope here proves an important aid to diagnosis. It throws light upon obscure conditions, and affords opportunity for recognition of the incipient stages of lesions so insidious and grave that, were the investigator deprived of the information it affords, an accurate diagnosis would frequently come too late for radical treatment. By means of the microscope knowledge of the histologic structure of the genital organs has been secured. It is apparent that it would prove equally valuable in betraying pathologic alterations in the course and progress of disease. Consequently, it proves a valuable aid in diagnosis, forming by its findings definite ideas concerning prognosis and demonstrating suitable methods of treatment.

60. Collection of Tissue. Tissue collected for microscopic examination is procured by test curetment and test excision. Occasionally, sufficient tissue can be expressed from the genital tract or escape in discharges, from which reasonably satisfactory microscopical examinations can be made. Generally, however, only small particles of tissue escape. These usually indicate the existence of marked degenerative changes; therefore the tissue must necessarily be so altered by necrobiotic processes as to render positive microscopic diagnoses uncertain and difficult. Test excision is employed in cases of suspected disease in the lower part of the genital tract and cervix. Test curetment is performed in cases of suspected disease in the interior of the corpus uteri. In certain conditions these two methods of collecting tissue may be combined with distinct advantage.

Test Excision. The method of collecting tissue from either the vagina or the cervix by test excision mustbe regarded as a surgical operation. Therefore the patient should be as carefully prepared as for a plastic operation. The bowel and bladder empty, the patient is placed in the dorsal position upon the table, the parts thoroughly cleansed, and the cervix exposed by introducing Edebohls' speculum or suitable retractors into the vagina; the cervix is then grasped with double tenacula, one upon each side or upon the anterior and posterior lip; and gentle traction is made to fix the organ nearer the vaginal orifice. With sharp scissors or scalpel a triangular or V-shaped piece of the cervix is so excised as to secure both healthy and diseased structure including a portion of the mucous membrane lining the cervical canal. The wound left from the excision should be closed with one or two sutures of catgut. Closure of the wound is followed by irrigation of the parts with warm sterile salt solution; the vaginal canal is lighty packed with iodoform gauze and a sterile perineal occlusion dressing applied. It is better, in the majority of cases, to employ general anesthesia for test excision, although it can be done by anesthetizing the surface with a 2 per cent. solution of cocain applied on a cotton tampon. Infiltration anesthesia would permit of painless excision, but it destroys the cell structure and would, consequently, be misleading. Each step of the procedure for test excision should be executed with the utmost delicacy in order to avoid disturbing the architectural construction of the tissue, and, therefore, alterations in the living histological cell picture. This cannot be emphasized too strongly. Unfortunately, many surgeons collect tissue for investigation by the microscopist in so careless a manner that by the time the tissue reaches the pathologist's hands its structure is so changed as to render intelligent study almost impossible.

The excised tissue should be washed in running water and carefully inspected with the naked eye then with a magnifying glass, by which its color, consistence, and general structure can be recognized and noted. During this inspection the question can be determined as to what course shall be pursued in fixing and preparing it for a more complete examination. As the tissue will undergo marked change in this process of fixing, it is wise that a drawing should be made and the direction determined in which the future sections are to be cut. Abel advises that excised portions be so divided that one part can be examined while fresh, and the other prepared for finer sections.

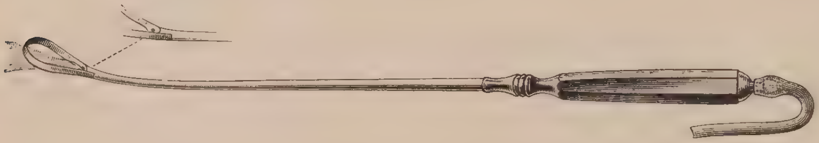


FIG. 99.—Douche Curet.

Test Curetment. In employing the curet to secure material for examination the same precautions concerning antisepsis and thorough preparation must be observed as in test excision. The operation is performed as follows: the patient is put under general anesthesia, in the dorsal position. The vulva and vaginal canal are thoroughly sterilized. The cervix is exposed by an Edebohls' speculum or suitable retractors, the anterior cervical lip fixed with double tenacula, the cervical and uterine canals delicately and carefully dilated. The utmost caution should be practised in every step of the procedure. Undue force must positively be avoided in order to prevent injury of the tissue cells and distortion of the histology of the collected tissue, which would render microscopic examination unsatisfactory. Dilatation is best accomplished by Pratt's graduated dilators. By their use rapid and uniform dilatation is secured, with but little congestion or traumatism to the endometrium. Uterine dilatation may also be secured by the use of laminaria tents. One or two are introduced and allowed to remain for a period of twelve hours; when, if sufficient dilatation is not secured, a nest, comprising three or four tents, is introduced and allowed to remain twelve hours more. Dilatation by tents has the great advantage that it permits digital exploration of the uterine cavity. (See Dilatation.) This exploration, however, should follow the curetment, for the previous introduction of the finger would, to a certain degree, disarrange and render unsatisfactory the endometrium for microscopical examination. Tent dilatation has the disadvantage of requiring twelve to twenty-four hours, but this additional time is often compensated by the information afforded the exploring finger, because digital examination of the uterine interior may disclose lesions which the curet has failed to reveal. In the employment of either method described a high degree of dilatation should be secured. The uterus is cureted with a long, sharp douche curet having an acute angle. It is well to start the curetment at a fixed point, either the posterior or lateral wall, and with long successive sweeps, proceed from the fundus to the cervical opening, removing the membrane to the muscle structure. As the tissue escapes from the uterus it should be collected by an assistant in a sieve made of paraffin paper. (Fig. 100.)

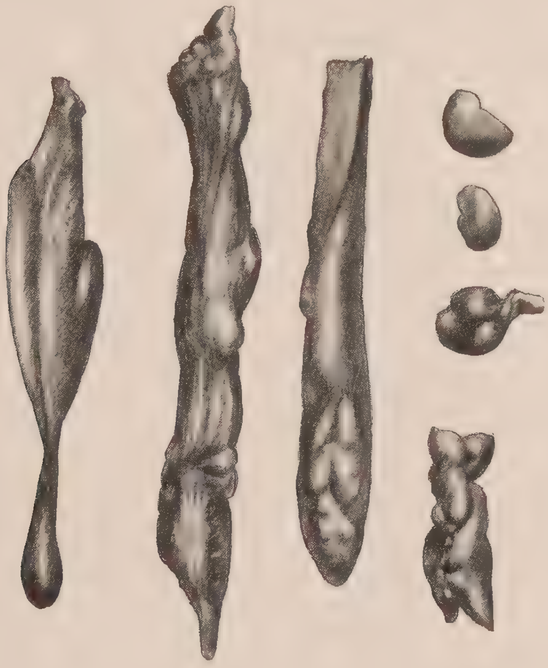


FIG. 100.—Tissue Removed by Test Curetment.

The collection of cureted tissue on sterile gauze is to be condemned. The tissue adheres to this material, and in its removal the individual elements are torn and distorted. Tissue thus collected is first examined microscopically and any peculiarities recorded, after which it should be immediately transferred to a fixing solution unless frozen sections are preferred.

61. Disposition of Tissue. That injuries result from undue and careless handling of tissue after test excision or curetment cannot be too strongly emphasized. Surgeons often fail to realize the value of avoiding careless manipulation of specimens and frequently destroy unwittingly the living cell construction by prolonged exposure of the specimen to the air and injudicious handling. The advantages of fixing the tissue immediately after removal are many. The wrapping of any specimen in gauze, as already mentioned, is to be positively condemned. Tissue so treated soon dries, the gauze becomes firmly adherent to it, and in its removal tears and disarranges the surface cells. In case the fixative agent is not at hand, cureted or excised tissue can, without harm or injury, be temporarily placed in paraffin paper, although it is decidedly advantageous to have fixative agents prepared and ready for the reception of the material prior to its removal. By such means the individual cell elements are permanently fixed as they occur in life, and the microscopist is thus enabled to study satisfactorily the cell chemistry and general cell construction of the specimens. When these are placed in fixative agents the vehicle containing them should be numbered and properly labeled. The label should contain the name of the patient, her age, the date of operation, the character of the operation, the part from which the tissue is obtained, together with a brief history.

62. Examination. The specimens may be examined as teased specimens, or be cut with the freezing microtome. The latter course is preferable, as it interferes less with the relations of the structures, and consequently permits a more correct judgment as to the condition.

By teasing, the elements are separated from each other when it is impossible to decide whether the surface epithelium sends processes into the tissues or whether a simple hyperplastic or destructive process exists—points of the greatest importance in arriving at a correct diagnosis.

The fresh specimen should be cut with the freezing microtome, but the sections should not be too thin, as they are likely to tear in subsequent manipulation.

Each section is removed from the knife with a camel's-hair brush and placed in distilled water. To prevent the section from being torn in transmission to the slide, it is better to push the latter under the section as it swims in the fluid and hold it gently with a glass rod.

The section, having been spread carefully upon the slide, is then covered with a fine cover-glass. The latter is grasped at one edge with forceps, the opposite side brought at an acute angle upon the fluid covering the surface of the slide and gently released, removing the superfluous fluid with blotting-paper. The section can now be studied with high or low power, but when unstained is best placed upon a dark under-layer.

Specimens so studied show the cells as they were during life, and the character of the normal tissue or any degenerative process can thus be recognized.

The specimen may be subjected to various microchemical reactions which will afford valuable information. The section may be rendered more transparent by a drop of a 2 or 3 per cent. solution of acetic acid placed under the edge of the cover-glass. A piece of blotting-paper held at the other side causes it to penetrate the section quickly. Fatty tissues may be removed by the similar use of alcohol, chloroform, or ether.

Elastic fibers are rendered prominent by caustic soda in a 1 to 3 per cent. solution. Marked swelling of the contractile elements of smooth and striated muscles and of the nuclei occurs, and the horny substance becomes transparent. A 33 per cent. solution of caustic potash is especially valuable as a preservative. Red blood-cells preserve their form well in such a solution.

Infarcts are in no way so well observed as in fresh specimens. They may be permanently preserved by replacing the salt solution with glycerin, or preferably with a 55 per cent. solution of potassium acetate. Pick's method presents the best procedure for preserving frozen specimens, and consists in the use of alum-carmin combined with formalin.

The alum-carmin of Grenach (4 to 5 per cent. of carmin) is added to Schering's formalin 10 to 100, which should be kept in a dark-colored bottle.

Pick's process is as follows:

1. Preparation of the frozen section with Jung's microtome.
2. Transference of the section into a 4 per cent. formalin solution for fifteen seconds.
3. Formalin-alum-carmin, two to three minutes.
4. Washing in water, one-half minute.
5. Eighty per cent. alcohol, one-half minute.
6. Absolute alcohol, ten seconds.
7. Carbol-xylol, one-half minute.
8. Canada balsam.

Coplin says that his experience convinces him of the necessity for fixing all tissues thoroughly before attempting to section them, otherwise the results are always open to criticism, because the distortion incident to congelation masses, maceration, and the difficulty of removing the infiltrates produce conditions which would mislead the most experienced observer. He advises the following fluids:

1. *Flemming's solution,* which consists of: 1 per cent. aqueous solution of chromic acid, 25 volumes; 1 per cent. aqueous solution of osmic acid, 10 volumes; 1 per cent. aqueous solution of acetic acid, 10 volumes; water, 55 volumes.

All water in stock solutions and final mixtures must be distilled. Small pieces (5/10 to 1 c.cm.) will undergo sufficient fixation in one-half to two hours. After this process is complete they should be washed in running water for six hours.

2. *Hermann's solution:* 1 per cent. aqueous solution of platinic chlorid, 15 volumes; 2 per cent. aqueous solution of osmic acid, 2 volumes; glacial acetic acid, 1 volume.

3. *Coplin* regards *corrosive sublimate solution* as the most useful fixing agent for general use, although for pure cell study the first two solutions are probably better. It consists of 125 gm. of corrosive sublimate dissolved in a liter of 0.5 per cent. solution of sodium chlorid in water. Small pieces fix in this solution in one-half to two hours. The used solution is filtered back into the stock solution, while the hardened tissue is washed in water, or preferably in 70 per cent. alcohol. This solution has the advantage of cheapness, keeping qualities, and simplicity.

With any of these, the quantity of fluid should exceed several times the volume of tissue to be fixed.

It is important for purposes of diagnosis that the tissues not only should be fixed properly, but that sections should be made with as little disturbance of cell relation as possible. Attention also must be given to the direction in which sections shall be made through the tissues. Sections parallel with the surface of a mucous membrane are of little value, as they cut across glands and afford no indication of the true character of epithelium. The most serviceable are the vertical or slightly oblique.

Embedding. A small piece of tissue may be prepared for section-cutting by being embedded in either gelatin, celloidin, or paraffin.

Glycerin-gelatin. Ten grams of the finest gelatin are placed in a clean vessel and covered with water. After four to six hours the water is poured off, and the mass liquefied by moderate heat. While stirring with a glass rod, 10 grams of glycerin and 5 drops of carbolic acid are added, and the mixture left in a wide-mouthed bottle. To embed a specimen, a piece of this mass is taken and liquefied by heat. A thin layer is poured upon a cork surface, the specimen placed upon it and covered with a mantle of gelatin which soon becomes hard.

After being immersed in absolute alcohol for twenty-four hours good sections can be made.

Celloidin. The specimen is placed for twenty-four hours in absolute alcohol, and the same length of time in sulphuric ether. It then remains twenty-four hours in a tight bottle containing thin celloidin. At the end of this period it is placed in a thick solution, a small opening being left so that the alcohol and ether evaporate very slowly. In a few hours a semi-solid mass has formed, a block of which containing the specimen is cut out, fastened with thick celloidin upon cork or wood, after which it remains for twelve hours in a 70 to 80 per cent. solution of alcohol, when it has the proper consistence for section-cutting.

Paraffin. Abel prefers to stain the specimen preparatory to embedding in paraffin. The specimen, hardened in alcohol, is placed in the staining solution. This may be Bohmer's hematoxylin, eosin, or safranin. It should remain in a well-filtered solution two to eight days, according to its thickness. It is removed from the staining solution to 70 per cent. alcohol for twenty-four hours, then is dehydrated in absolute alcohol. It is placed in xylol for twelve hours to prepare it for saturation with paraffin. The specimen is placed in a mixture of equal parts of xylol and paraffin, in which it remains for twenty-four hours, subjected to a continuous temperature of 37° C. in a paraffin oven, after which it is kept in paraffin at a temperature of 48° to 50° C. The latter is then permitted to solidify at the room temperature, when a paraffin block of suitable size containing the specimen is cut out and fastened to a cork or piece of wood with paraffin, after which it is ready for cutting.

The sections thus secured are thinner than those secured by any other method.

Section-cutting. Sections are preferably cut with a microtome and should be of equal thickness. A thickness of 3 to 5 microns will be satisfactory.

The sections are conveyed with a camel's-hair brush to a basin containing dilute or absolute alcohol; the celloidin sections to a 70 per cent. solution of alcohol, the gelatin sections to absolute alcohol. The sections are very much shriveled by the alcohol and should be placed in water for several minutes before being transferred to the staining fluid.

The paraffin sections cannot be transferred from one vessel to another; it is better to treat them on the slide. Abel applies 1 drop of a solution of collodion in alcohol upon a slide, and upon this the section, pressing it down with filter-paper. The paraffin is dissolved out with xylol, and covered with equal parts of xylol and Canada balsam, and over this the cover-glass is placed carefully.

Staining. We will consider only those methods which are most effective in rendering prominent the histologic structures we are desirous of utilizing in the diagnosis. Picrolithiocarmin and hematoxylin are both very satisfactory.

Picrolithiocarmin, introduced by Orth, is prepared by uniting one part of lithiocarmin (a cold saturated solution of lithium carbonate in which carmin powder has been dissolved in the proportion of 2.5 grams of the latter to 100 grams of the former solution) with two parts of a saturated solution of picric acid. This stain is most suitable for specimens which have been hardened with alcohol. The section is placed in the staining solution by a spatula and remains five to ten minutes, from which it is conveyed for one to two minutes to a solution of alcohol (70 per cent.) one hundred parts, hydrochloric acid one part, then washed in dilute alcohol and dehydrated in absolute alcohol. The specimen is made clearer by oil of cloves, oil bergamot, or xylol. It is conveyed to the slide and spread out free of folds. It is then mounted in Canada balsam. Horny cells, fibrin, hyaline substances, and red blood-corpuscles take on a yellow color. The nuclei of the epithelium become a pale pink, and the fibrillar tissue remains undyed, affording a clear picture of the specimen stained. Hematoxylin stain is prepared by Coplin after Delafield as follows: Dissolve 4 gm. of hematoxylin crystals in 25 c.c. of strong alcohol; add this solution to 400 c.c. of a cold, filtered, saturated aqueous solution of ammonia alum; expose to light and air for several days. Filter and add glycerin 100 c.c. and methyl alcohol 100 c.c. This preparation is allowed to stand in light, with the bottle loosely corked; this mixture turns dark purple or almost black. After assuming this color it should be filtered and placed in tightly stoppered bottles. Before being used it should be largely diluted.

If properly prepared this stain will last for years. The great objection to Delafield's mixture is that it requires time for ripening and therefore cannot be used immediately after being made. Harris has overcome this objection by preparing the mixture as follows: Dissolve 1 gm. of hematoxylin in 10 c.c. of alcohol and add the resulting solution to 200 c.c. of distilled water in which 20 gm. of ammonia or potassium alum have previously been dissolved. This fluid is heated in a flask to boiling, at which time 1 gm. of mercuric acid is added. The solution darkens (ripens) at once and is now ready for use, but should always be diluted. From this stock solution an acid hematoxylin may be prepared by adding 4 c.c. of glacial acetic acid and 30 c.c. of glycerin to 70 c.c. to the primary solution. This acid preparation has the great advantage of rendering overstaining almost impossible.

Hematoxylin Staining. To use the hematoxylin stain of Delafield or Harris the sections cemented to the slides are covered with the diluted stain from five to fifteen mintues. They are then washed in water, dehydrated in alcohol, cleared with creasote, and mounted in Canada balsam. Coplin states that a better result is obtained by placing enough distilled water in a staining dish to immerse the slide on end. To this sufficient hematoxylin is added to tinge the water rather deeply. The sections adherent to the slides are permitted to remain in this solution twelve to twenty-four hours. They are then cleansed in water and treated as directed previously. Hematoxylin stains the nucleus purple and gives a faint tint to the protoplasm shapes. Definition of the protoplasm can be secured by following the hematoxylin staining if the slides and section are placed in an 0.5 alcoholic solution of eosin for one or two minutes. The excess of water is removed and section washed in alcohol, cleared in creasote, and mounted in balsam. This method stains the nuclei purple and the surrounding protoplasm pinkish. Moreover, the eosin stains the erythrocytes present. One of the very best contrast stains is that suggested by Van Geison, which is composed of the following:

Acid fuchsin (1 per cent. aqueous solution),	15 c.c.
Picric acid (saturated solution),	50 c.c.
Water,	50 c.c.

In using this stain the sections are first stained with hematoxylin, washed in water, followed by applying the Van Geison stain for four or five minutes, dehydrated in alcohol, cleared in xylol, and mounted in xylol balsam. By this method the connective tissue appears red or pinkish-red, the cell protoplasm yellow, and the nuclei dark brownish or reddish-purple.

Hematoxylin stain is prepared by dissolving 1 gram of hematoxylin in 30 grams of absolute alcohol. To a solution of powdered alum (0.5 to 1 gram in distilled water 30 cm.) the above preparation is added drop by drop and shaken until the fluid takes a deep violet color.

Celloidin-embedded sections remain ten to twenty minutes longer, according to size and thickness, in the solution than sections prepared by other methods, and are placed in alcohol containing hydrochloric acid until they begin to assume a red tint, from which they are removed to 70 per cent. alcohol. They are placed in absolute alcohol until the mantle of celloidin begins to curl. Care must be exercised that all the celloidin is not dissolved or the finer sections would fall to pieces. The section is made transparent in oil of bergamot or in xylol. Should the celloidin mantle at this stage become cloudy or milky, the section should be placed in absolute alcohol until it clears. The section is placed upon a slide with a spatula and mounted in xylol-Canada balsam after removing the oil with filter-paper. This method gives splendid staining of the nuclei, the protoplasm is slightly stained, the celloidin not at all. The diagnosis of malignant conditions is greatly enhanced by staining the elastic fibers. For this purpose Taenzer's orcein stain is employed. The sections are taken from water and kept in this solution from six to twelve hours or longer (Grübler's orcein 0.5, alcohol 40.0, aq. dest. 20.0, hydrochloric acid gtt. xx), then placed for a few seconds in hydrochloric acid alcohol (hydrochloric acid 0.1, 95 per cent. alcohol 20.0, aq. dest. 5.0), where they become differentiated and are washed in water. After five to ten minutes' dehydration in absolute alcohol, they are cleared in oil and mounted in Canada balsam.

The elastic fibers appear as an intense red upon a pale pink background.

Weigert's fuchsin-resorcin stain is made by taking 200 c.c. of the following mixture: Resorcin 2.0, fuchsin 1.0, distilled water 100.0, and bringing it to a boil in a procelain vessel, when 25 c.c. ferri liq. sesquichlor. (German Pharmacopeia) are added, the whole stirred while boiling for two to five minutes longer. The muddy mass thus formed is permitted to cool and is filtered. The portion which runs through the filter is thrown away, and the deposit left upon the filter until it ceases to drip.

The filter with its contents is removed from the funnel, placed in a bowl, and boiled under constant stirring with 200 c.c. 94 per cent. alcohol. While boiling, the filter-paper is removed and the solution is permitted to cool, after which it is filtered and the filtrate brought to 200 c.c. by the addition of alcohol. After adding 4 c.c. of hydrochloric acid the solution is ready for use.

The sections are placed in this solution for twenty minutes to one hour, washed in alcohol, and cleared in xylol.

The elastic fibers are stained dark blue, almost black, on a quite light background. The nuclei may be stained with a carmin preparation.

63. Preservation of Gross Specimens and Slides. In order to keep a complete case record it should be the rule to preserve the gross specimens and slides containing sections therefrom. Many agents have been recommended for the preservation of gross specimens. Alcohol is perhaps the reagent most commonly employed, but by its use the density of the specimens is altered, the color entirely lost, and general outline indifferently retained. Formalin has recently gained considerable prominence as a valuable preservative. A 10 per cent. solution of the commercial preparation is usually employed. Specimens prepared by this method can be used with a higher degree of satisfaction for histologic study than those prepared with alcohol. Specimens when not too large can also be preserved in formalin vapor by placing them in an air-tight jar containing a bed of cotton which has been previously moistened with pure formalin. The specimen should be placed upon the cotton and covered with filter-paper moistened with the reagent. For the retention of the color of gross specimens no method possesses such advantages as those afforded by the use of Kaiserling's solution. Two solutions are necessary and are composed of the following.

Solution A.

Formalin,	250 c.c.
Nitrate of potassium,	10 gm.
Acetate of potassium,	30 gm.
Water,	1 liter.

Solution B.

Acetate of potassium,	200 gm.
Glycerin,	400 c.c.
Water,	2000 c.c.
Formalin, to point of saturation.	

The specimen prior to being placed in the preservative is lightly washed with running water to remove adhering blood and is then placed, according to size, from one to twenty-four hours in Solution A, at the end of which period it is changed to a fresh Solution A, in which it is allowed to remain from two to thirty-six hours. It is then washed in running water from fifteen minutes to one hour and placed in 80 per cent. alcohol in order to cause a reappearance of the color. Unless the color shows signs of returning the specimen in transferred to 95 per cent. alcohol, in which it is allowed to remain until the color is fully restored. After the color is thus restored the specimen is placed in Solution B and at the end of twenty-four to forty-eight hours it should be placed in a fresh portion of Solution B.

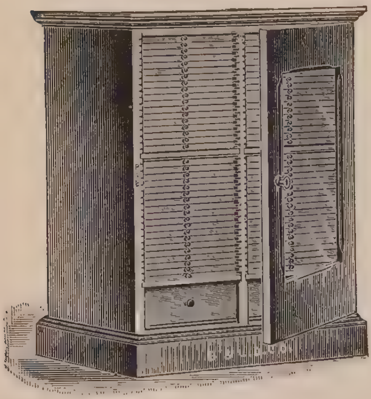


Fig. 101.—Cabinet with Trays and Card Index for the Preservation of Slides.

To preserve slides the best results are obtained by using a card index system. Special histologic or slide cases are made containing trays for the slides and also a card index as shown in Fig. 101. By using this method the slide is labeled and numbered. A corresponding number is on the index card which contains the name of the patient, her age, date, occupation, name of organ from which tissue was removed, and pathologic diagnosis. An ingenious slide card index has been devised by Coplin. (Figs. 102 and 103.) The slides are properly labeled, numbered and then placed in the card and secured by sealing the free end of the card paper. The index card is marked as described above. The cards containing the slide are preserved in dust proof drawers. This method offers the advantage that the slide cannot be separated from the name of the patient, and from its ingenious arrangement can be submitted to microscopic examination without removal from the card.

64. Failure. Examination may fail to reveal the true character or presence of disease, because the section was made through the adjoining healthy tissue. The examination may also prove unsatisfactory and worthless as a result of mutilation and distortion of the specimen incident to undue manipulation; carelessness in collection; and improper technique in preparation for study.

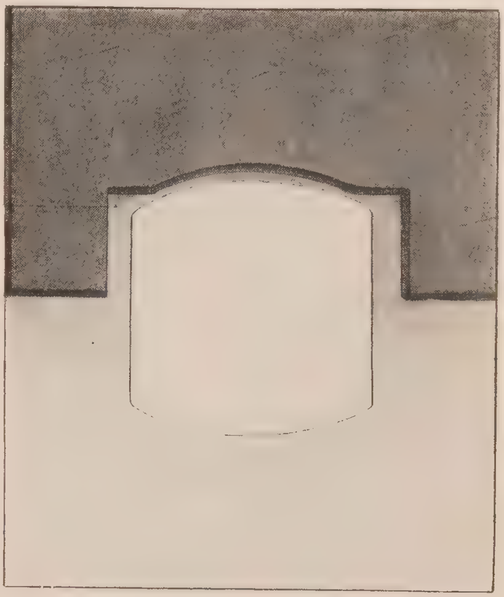


Fig. 102.—Coplin's Method of Indexing and Preserving Slides.

65. Bacteriology of the Genital Tract. The importance of careful bacteriologic examinations of the secretions of the genital tract cannot be overestimated. Careful bacteriologic analyses of the genital secretions not only increases the clinical interest of a case, or special cases, but stimulates scientific research, and, therefore, renders the case records complete and more worthy of preservation. Furthermore, scientific bacteriologic examinations of the secretions of the genital tract will enable us to diagnose definitely the provocative factor in conditions which might otherwise remain obscure. We are enabled to determine also the specificity, sterility or

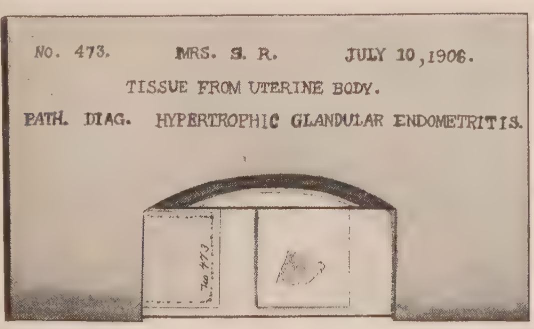

NO. 473. MRS. S. R. JULY 10,1906.
TISSUE FROM UTERINE BODY.
PATH. DIAG. HYPERTROPHIC GLANDULAR ENDOMETRITIS.
No 473

Fig. 103.—Same as Fig. 102. Folded with Slide Enclosed.

virulence of inflammatory accumulations and thus become better qualified to advise and institute proper methods of treatment and to interpret, to a certain degree, the prognosis

66. Parasites, both of animal and vegetable origin, as in all other cavities of the body, are found in the genital tract. Of course, here, as elsewhere in the body, bacteria or vegetable parasites preponderate and are the most provocative of harm. In health, micro-organisms inhabiting the genital canal are limited to the structures of the vulva and the vaginal canal. Furthermore, even in this part of the genitalia, they are found in minimum numbers and attenuated in virulence. The uterus and Fallopian tubes are normally free from bacteria. The special organism cultivated and described by Döderlein is found more or less constant in the vaginal canal and has been termed the acid vaginal bacillus of Döderlein. It is said to generate lactic acid and is a rod-shaped bacillus of the anaerobic type. Its discoverer believes it to be a protective force against the invasion and action of pathogenic germs. He further believes that even if pathogenic bacteria gain entrance to the vagina their virulence is attenuated by the presence of this germ. This micro-organism flourishes in the normal *acid secretion* of the vagina, and if the acidity of the vaginal secretion is destroyed it disappears and other bacteria flourish. It has been demonstrated by Stroganoff that micro-organisms are more numerous in the vagina preceding and following menstruation. It has been discovered that the infectious properties of bacteria are diminished as they ascend the vaginal canal and approach the cervix. In the newborn the vaginal canal is entirely bacteria free, but soon after birth their presence can be demonstrated. In the normal individual, according to Krönig, Menge, and Whitridge Williams, it is not possible for bacteria to exist long in the healthy vaginal secretion. Krönig demonstrated the germicidal action of vaginal secretion by introducing various organisms into the vagina of a normal individual. At the end of two days the vagina became entirely bacteria free. Streptococci were the first to succumb, staphylococci and pyocyanei living twice as long. During pregnancy it is asserted that the acidity of the vaginal secretion is increased and that bacteria are not present. Williams, in ninety-two pregnant women, found the skin staphylococcus twice, never the streptococcus. Krönig, in forty-eight pregnant women, did not find any. From extensive observations it is asserted, therefore, that pyogenic bacteria, when found in the puerperal genital tract, have been introduced from without. From a bacteriologic standpoint the healthy genital canal can be separated into three portions: the inferior portion, comprising the vulva and vagina to the cervix, contain bacteria; the middle, comprising the cervical canal between the external and internal os, as a rule, is free from bacteria; while the remaining portion, formed by the uterus, tubes, and ovaries, is entirely free from germs. Menge, in his investigations of uteri removed in Zweifel's clinic, was not able to cultivate germs on any ordinary culture media. The external os can be said to be the boundary line between that part of the genital tract containing micro-organisms (vulva and vagina) and the part bacteria free (uterus, tubes, and ovaries). The vulva and the vaginal canal always contain bacteria, and Edgar found in twenty-eight pregnant women and two parturient women pyogenic bacteria present in 40 per cent. Natvig believes that when pyogenic cocci are found in the normal vulva and vaginal secretions, they exist as saprophytes. Under favorable conditions, such as have been mentioned, they may multiply, become virulent and invade the structures higher up.

67. Natural Agents of Immunity. It has been demonstrated that parasites of many varieties, both animal and vegetable, are found more or less constantly in the lower portion of the genital canal in the normally healthy woman. They are present, however, only in small numbers and with attenuated specificity. This is because nature provides natural agents of protection or immunity. The protective powers of the normal genital canal are: 1, the acid secretion of the vagina which is decidedly inimical to pathogenic bacteria; 2, the dense arrangement and phagocytic action of the wall of stratified epithelium lining the vagina which is also hostile to invading micro-organisms; 3, the plug or coagulated secretion commonly found in the os externum, which, while not truly germicidal, acts as a barrier against the entrance of germs into the uterine cavity and structures above; 4, the restraining and destructive influence exerted by the bacillus of Döderlein against invading pathogenic bacteria which has been mentioned.

Therefore it may be asserted that so long as the vaginal epithelium remains healthy and intact, the natural secretions normally generated and the vaginal bacilli present, pathogenic bacteria may be found, but their excessive production is inhibited and their destructive influence allayed.

68. Loss of Protection. Certain conditions alter the normal acid secretion of the vagina, rid the canal of its protective micro-organisms, and change the epithelial wall. This permits the proliferation of infectious micro-organisms and the generation of their poisons. Traumatisms produced by manipulation, rough examinations, raw surfaces left by operation, and injuries resulting from labor afford gateways for the introduction of infectious germs into the absorbing tissue tracts. The natural bactericidal secretion of the vagina is rendered neutral or alkaline or wholly destroyed by increased discharge from above, such as takes place during menstruation, during parturition, and in alternations of general health. Repeated examinations and persistent douching also destroy the antiseptic properties of the vaginal canal.

69. Parasites. I have already indicated that parasites of all varieties, both animal and vegetable, are found in the genital tract. I stated that the vegetable were the most powerful for harm. The following table classifies and shows the varieties of parasites most frequently found:

VEGETABLE (BACTERIA).

Staphylococcus pyogenes aureus.
Staphylococcus pyogenes albus.
Streptococcus pyogenes.

Gonococcus.

Smegma bacillus

Bacillus typhosus.
Bacillus pyocyaneus.
Bacillus aërogenes capsulatus.

Bacillus coli communis.
Bacillus tuberculosis.
Spirocheta pallida.
Organism of chancroid.
Bacillus diphtheria.
Pneumococcus.
Diplococcus of Siegelman.

ANIMAL.

Pediculosis pubis.
Ascaris scabiei.
Oxyuris vermicularis.
Ascaris lumbricoides.
Tænia echinococcus.

70. Staphylococcus. The staphylococcus pyogenes aureus is perhaps the micro-organism most commonly found in localized suppurative processes, and, according to Coplin, Curry found it present in fifty-two of one hundred and fifteen abscesses. The staphylococcus pyogenes albus was present in twenty-nine. (Fig. 104.) The tendency of the staphylococcus is to cause local suppurative lesions, although it may produce general pyemic infection and fatal septicemia. I recall one case of fatal staphylococcemia in which pure cultures of staphylococci were found in the blood following a plastic operation on the perineum and cervix. This germ is found singly, in pairs, in fours, and in short chains, but generally in irregular clusters or grape-like bunches. It grows in all ordinary culture media at a temperature between 20° C. and 40° C. It liquefies gelatin rapidly and in the process of growth the colonies fall to the bottom of the medium, assuming a bright orange yellow color, hence its name. The culture colonies are at first small and of a white hue, but by the third day they assume the characteristic golden-yellow or orange color. The staphylococcus stains by all the common anilin dyes, but does not respond to Gram's method. The staphylococcus and its kin are perhaps the most frequent cause of local inflammation and suppuration of the uterus and its appendages and of the pelvic peritoneum. A special feature of this germ is its strong attractive chemotactic influence upon leukocytes, particularly the polynuclear cell. In two thousand and ninety-eight cases of purulent salpingitis three hundred and seventy-four were found to be due to puerperal septic infection, mostly of staphylococcic origin.

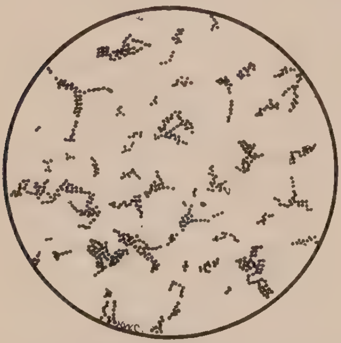


FIG. 104.—Staphylococcus Pyogenes Aureus. From Pure Culture in Bouillon. (Zeiss, 2 mm., Oc. *c*.)

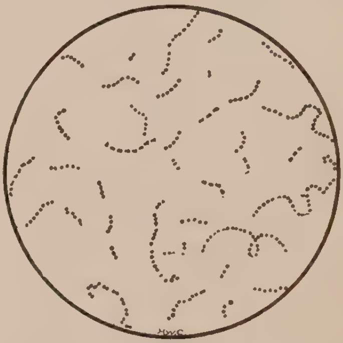


FIG. 105.—Streptococcus Pyogenes. From Culture in Bouillon. (Zeiss, 2 mm. Obj., Oc. *c*.)

71. Streptococcus. The streptococcus pyogenes generally occurs in chains. It is the most virulent of all the pyogenic cocci and measures one-half to one micron in diameter. (Fig. 105.) It grows well at a temperature of from 30° C. to 40° C., but does not grow readily below 20° C. and is killed in ten minutes at 52° C. It grows on all common culture media, appearing as small elevated circular colonies of a grayish-white color. It does not liquefy gelatin. The streptococcus stains with the common anilin dyes and is positive to Gram's method. This germ is found in spreading inflammatory processes, with or without suppuration; in serious phlegmonous and erysipelatous conditions and suppurations; and in serous membranes and joints; also in malignant endocarditis and suppurative periostitis. It is found in inflammatory disease of the mucous membrane, particularly of the throat, where it causes a pseudo-diphtheritic inflammation. In puerperal peritonitis it is found in a condition of purity. This organism is undoubtedly the most frequent cause of puerperal septicemia. The streptococcus is less local in its action and far more virulent than the staphylococcus. In septic peritonitis and puerperal septicemia the organism is usually conveyed to the vaginal canal or uterus from without. It is transported from the vagina or the uterus to the pelvic peritoneum through the lymph channels, blood-vessels, and by penetration of the uterine wall. The late Dr. Pryor asserted that the passage of this germ through the uterine wall should be counted by hours and not days. Sections of puerperal septic uteri demonstrate that Dr. Pryor was not incorrect in this assertion, for in nearly all cases the organism can be recognized microscopically throughout the tissues of the uterus. Döderlein, in his investigations of the vaginal secretions of nearly two hundred women, found only one-half normal. The remainder were bacteriologically abnormal. In 10 per cent. of the normal cases the streptococcus pyogenes was present, and inoculations with the secretions

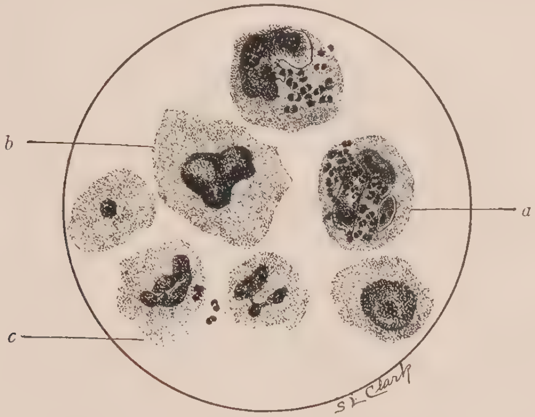


FIG. 106.—Secretion from Gonorrheal Vaginitis, Showing the Gonococci Both Within and Without the Pus-cells.
a, Pus-cell Containing Gonococci; *b*, Pus-cell Undergoing Dissolution; *c*, Large Epithelial Cell.

from 50 per cent. of these revealed that they were pathogenic for animals. Secondary abscesses in the lymphatic glands are more frequently caused by streptococci than by staphylococci. However, the virulence of the streptococci varies.

72. Gonococcus. The gonococcus was first described by Neisser in 1879, and later cultivated in solidified serum by Bumm and others. It has been determined definitely to be the specific cause of gonorrhea. The gonococcus under the microscope resembles in appearance two coffee-beans placed side by side, with an unstained oval interval. Sternberg applied the term "biscuit-shaped" coccus. (Fig. 106.) Irregular and degenerative forms of the germ are seen, however. This germ is sometimes difficult to cultivate on artificial culture media. (Fig. 106.) It grows slowly on human blood serum, acid urine agar, blood-smeared agar or on Wertheim's media, appearing, at the end of twenty-four or forty-eight hours after inoculation, as small, irregular, rounded colonies of a grayish-yellow color. The margins of the colonies are undulated and sometimes show small projections. Colonies vary in size and tend to remain separate. They reach their maximum size on the fourth or fifth day and, according to Muir and Ritchie, die on the ninth day or. earlier. The germ stains readily with the basic anilin dyes, but does not stain by Gram's method. The gonococcus is found in large numbers in pus of acute gonorrhea, both in the male and female. For the most part, it is contained within the leukocytes. In the earlier stages it is also found outside the pus-cells, but when the discharge is wholly purulent the greater portion are found within the pus-cells. Harmsen, in examining gonorrheal secretion, found that in the early stage the discharge was of a catarrhal and slightly purulent character, composed of leukocytes with a few epithelial cells and no gonococci. As a rule, gonococci appear a few days after the onset, but as the disease advances, the leukocytes and

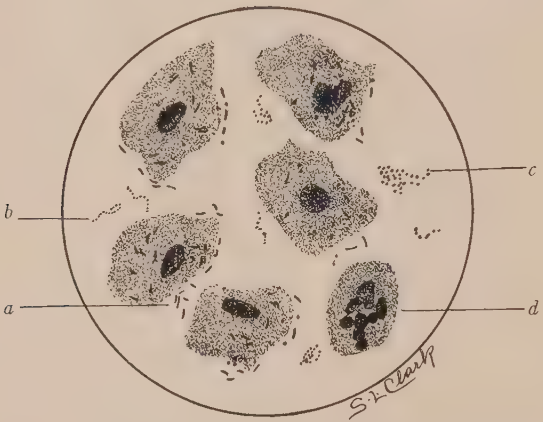


FIG. 107.—Secretion of Simple Vaginitis, Showing Various Forms of Organisms Found and Preponderance of Epithelial Cells.
a, Bacilli; *b*, Streptococci; *c*, Staphylococci; *d*, Pus-cell.

cocci disappear and are replaced by granular epithelial cells and the organisms normally found. Therefore, the absence of the germ in the first stage of the discharge is significant, as well as in the last stage. Microscopic examinations should begin early and be made daily until the germ is found. The absence of the gonococcus and the reappearence of the epithelial cells and organisms normally found indicate that the disease is progressing toward cure. Gonococci are also found in purulent secretion of gonorrheal ophthalmia and throughout the genital tract when these organs are the seat of Neisserian infection. The tendency of the organism is usually to remain and cause local genital lesions. It is not responsible for disseminated genital infections alone, but is responsible also for generalized or systemic lesions, and has been found in pure culture in the blood. Gonococcemia usually results from infections of the genitourinary organs, but cases have been recorded where blood infection has occurred from gonorrheal ophthalmia. Cases of endocarditis, endarteritis, suppurative arthritis, and general pyemia have resulted from absorption of the organism. The gonococcus is, unfortunately, found present to an alarming degree. In the female it is undoubtedly the most destructive of all the pyogenic cocci. When once implanted on the mucosa of the female genital tract, it rarely, if ever, is eradicated. Sanger, in a series of nineteen hundred and thirty cases, reports two hundred and thirty suffering from gonorrheal infection. A committe appointed by the American Medical Association found that in pelvic disorders of women requiring surgical interference 40 per cent. were of specific diplococcus origin. In the gynecological wards of Jefferson Medical College Hospital one in 5 or 20 per cent. of operations performed are for lesions resulting from the action of the gonococcus. Andrews, discussing the etiology of salpingitis from a series of statistics collected from twenty-eight sources, shows that in six hundred and eighty-two suppurative tubes the gonococcus was found present one hundred and fifty-five times in three hundred and eight cases in which micro-organisms were demonstrated. In three hundred and seventy-four the pus was sterile. He believed that many of these were primarily of gonorrheal origin. Kleinhaus, in two hundred and eighteen pus tubes, found the gonococcus present seventy-four times. The large number of sterile tubes found was explained by the fact that the gonococcus disappears early from pus. It is, moreover, extremely difficult to demonstrate the micro-organism in the tubal wall. However, the gonococcus does not always disappear from the contents of the pus tubes early, because cases have been reported of operation on old-standing pus tubes followed by suppurative peritonitis in which pure cultures of gonococci were obtained. The gonococcus, while violent and destructive in action, is perhaps the most prolific cause of chronically invalided women as well as the causative factor in destroying the structure of the uterine mucous membrane, rendering it unfit for the lodgment, maintenance, and successful maturation of a fertilized ovum. It is also productive of great harm in the appendages of the uterus (the tubes and ovaries) working such changes in these organs as to demand their total sacrifice or causing such structural alterations as to prevent the proper performance of their especial functions. However, despite the virulent influence which the gonococcus exerts upon the generative organs of women, it rarely causes death. It is frequently responsible for violent attacks of peritonitis with alarming symptoms, but the inflammatory changes usually remain localized and do not spread as infections of this membrane do when caused by the staphylococcus, or, more particularly, the streptococcus. This is due to the fact that gonococci find a natural habitat and favorable nutrition in the cells and fluids of the mucous membrane lining the genital tract, particularly the cervix and Fallopian tubes, whereas the endothelial cells of the peritoneum and the peritoneal fluid are, to a certain degree, hostile and destructive to this germ, thus destroying many and driving others into a localized field of battle.

Gonorrheal infection in little girls is not an uncommon affliction. Its conduct may be just as serious as in the adult. If it makes its appearance in an institution for the care of children, the entire population may become infected, for it spreads as violently as scarlet fever. The first consideration, therefore, should be early isolation. The infection may he conveyed by servants. It is frequently conveyed by rape. W. Travis Gibb, in his association for fifteen years with the New York Society for the Prevention of Cruelty to Children, has examined eight hundred girls, ranging in age from eight months to sixteen years, on whom rape and other serious crimes had been committed. He found that almost 13 per cent. of all these children suffered with venereal disease, 81 per cent. had gonorrhea, 2.5 per cent. had chancroids, and a small number of the cases examined had syphilis.

Gonorrheal infection in the female is a highly destructive disease, and J. T. Johnson says that no affliction of modern times has caused so much mortality, mutilation, and mental and physical suffering as gonorrhea has indirectly.

It is generally admitted to be the most widespread and universal of diseases. Morrow believes that no disease has such a muderous influence on the offspring as syphilis; that gonorrhea overshadows syphilis as a social peril, and no disease has a more destructive influence on the health and procreative function of women.

Bad as gonorrheal infection is, it is a question whether its evil effects have not been overestimated. The common belief that a man once infected is never free and is likely to infect his wife cannot be accepted fully. Erb, who made an exhaustive statistical study of the subject, is forced to this opinion. He investigated carefully the sexual histories of two-thousand male patients—principally of the middle class—and found that 48.5 per cent. had had gonorrhea. The wives of four hundred of these patients confessed to having had gonorrhea some time previous to marriage. Of these, three hundred and seventy-five, or 95.75 per cent., had never suffered from any pelvic infection that could have been of gonorrheal origin. Only seventeen, or 4.25 per cent., had had what were probably gonorrheal infections. As to the influence of ante-nuptial gonorrhea on fertility, among three hundred and seventy couples in this class, 68 per cent. had two or more children; 25 per cent. had four or more children; and but

12 per cent. were childless. In the latter, some other cause than gonorrhea was evident.

73. **Bacillus coli communis** is found present normally in the intestinal canal. Morphologically it resembles the typhoid bacillus. The colon bacillus is usually found in mixed infections, though pure infections by this organism occur. Andrews, in his bacteriologic statistic study of pus tubes, found that the colon bacillus was present in 2.5 per cent. (Fig. 108.) This germ is frequently responsible for inflammatory disorders of the intestinal canal and suppurative processes in the peritoneal cavity. If is often found in inflammation of the urinary passage, such as cystitis, pyelitis, and pyelonephrosis. Colon suppuration of the organs in the pelvis occurs, and Reed says that it is responsible for a certain percentage of cases of ovarian abscess. He claims that the contiguous surface of the diseased organ as it becomes adherent to the bowel affords an opportunity for the introduction of the germ. Roberts states that suppuration of ovarian cysts, especially after twisting of the pedicle and the resulting adhesions to the bowel, have a similar explanation, and many suppurative infections of the abdominal incision can be traced to this germ.

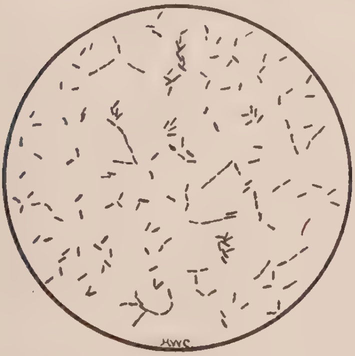


FIG. 108.—Bacillus Coli Communis. From Pure Culture in Bouillon. (Zeiss, 2 mm. Obj., Oc. *c*.)

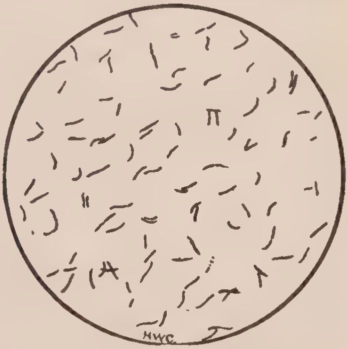


FIG. 109.—Bacillus Tuberculosis. (Zeiss, 2 mm., Oc. *c*.)

74. **Bacillus tuberculosis**, discovered by Koch in 1882, is rod-shaped, 1 1/2 to 3 1/2 microns long, 1/4 to 1/2 micron thick. It grows readily upon solidified blood serum and glycerin agar. It develops slowly, not appearing for two or three weeks after inoculation. (Fig. 109.) The colonies are of a creamish color and somewhat granular. This becomes more marked as the growth ages, and, according to Coplin, the surface of the colony takes on a bread-crumb appearance. The bacillus stains, with most of the basic anilin dyes and by Gram's method. It takes the stain slowly but securely, and is with difficulty decolorized. It resists strongly the decolorizing action of mineral acids in common with certain other organisms belonging to the acid-fast bacteria. Primary tuberculosis of any part of the genital tract is rare, though tuberculous lesions may occur in any portion. The Fallopian tubes are the organs most frequently infected, and next in order of frequency are the uterine body, ovaries, vagina, cervix

and vulva. Tuberculous infection of the vulva and vagina is rare, and is usually secondary to infection from the uterus. Tuberculosis of the vagina is frequently associated with or is secondary to tuberculous inflammation in other portions of the genito-urinary tract, as the bladder, bowel, peritoneum, or distant organs, as the lung or joints. Primary vaginal tuberculosis, however, has been reported by Friedländer. It has been demonstrated that the freedom of the vulva and vagina from tuberculosis is due to the resistance of the squamous epithelium to bacterial invasion. Tuberculosis of the vulva and vagina (lupus), while extremely rare, is a very destructive disease. Tuberculous infection of the vulva may extend over a period of many years. In one case under my observation in the terminal stages the entire vulva was totally destroyed, establishing fistulous communication between the vagina and rectum and vagina and bladder. I have frequently seen rectovaginal fistulæ as a result of tuberculous disease of the rectum. Tuberculous infection of the uterus also is rarely a primary disease: it is generally associated with or is secondary to tuberculous lesions in the tubes, peritoneum, or some other structure of the body. Tuberculosis of the uterus and the organs above occurs with greater frequency than is clinically observed, as careful postmortem examinations of individuals dying from pulmonary tuberculosis has proved, yet Martin, in sixteen hundred examinations of the uterine mucous membrane, found only twenty-four instances of tuberculous lesions in the uterus. According to Spaeth, tuberculous infection of the cervix constitutes about 5 per cent. of the cases of genital tuberculosis in women. The Fallopian tubes are the most frequent seat of genital tuberculosis. In a total of one hundred cases of pyosalpinx collected by Andrews 10 per cent. were tuberculous. The infection is usually secondary to tuberculous foci elsewhere in the body. In primary tubercular salpingitis the bacilli are introduced from without, and attack the tube by ascending the genital canal. Secondary infection of the tube usually results from tuberculous peritonitis, but it may also result from metastatic deposition through the blood- or lymph-vessels. Infection may be conveyed by contiguity of structure from a tuberculous ulcerating intestine to an adherent tube. Meyer reports fifty-seven cases of primary tuberculous tubal disease out of sixty-seven cases of genital tuberculosis. Orthmann states that primary tubal tuberculosis occurs in 18 per cent. of all cases of genital tuberculous infection in women. Rosthorn, in eighteen hundred and fourteen cases of inflammatory disease of the tubes, found tuberculous infection to be the exciting cause of twenty-nine. Tuberculous infection, particularly of the tubes, occurs in young children and in virgins. All cases of tuberculous peritonitis, however, are not necessarily associated with tuberculous inflammation of the tubes or uterus. I have operated on several cases of tuberculous peritonitis in young women, and in most of these careful observation failed to reveal any marked tuberculous process in these organs, although some of the cases were of long duration. It is stated by certain investigators that pre-existing gonorrheal infection of the tube predisposes to tuberculous disease. Infection of the ovaries by the tubercle bacillus is exceedingly rare, one or two cases of primary ovarian tuberculosis having been recorded, but in the vast majority of cases it is secondary to tuberculous infection of the Fallopian tubes, peritoneum, and intestines. In forty-eight cases of ovarian tuberculosis Orthmann traced the infection to the tubes in twenty-six and the peritoneum in twenty-two. Infection of the peritoneum by the tubercle bacillus occurs in men, women, and children. The disease may occur in the acute miliary, caseating, or chronic fibroid form. It is most frequent in women, and the relative frequency given by different observers is from 50 to 98 per cent; usually occurring in young women between twenty and thirty years of age, though the infection occurs at all ages. Tuberculous peritonitis was found two hundred and eighty-four times in thirteen thousand four hundrd and twenty-two autopsies studied by Grawitz and Brum, and the Mayos, in five thousand six hundred and eighty-seven operations, found it present eighty-nine times. Osler found that in abdominal operations for tuberculosis, laparotomy was performed twice as often in females as in males. An interesting feature of tuberculous infection of the peritoneum is the unusual occurrence of extensive lesions in other portions of the body.

Tuberculosis of the placenta is not an uncommon affection. Schmorl and Geipell report twenty such cases in patients suffering with various forms of advanced phthisis.

75. Syphilis and Chancroid. Chancroid usually makes its appearance upon one labia; often upon both. It is seen quite commonly as an irregular, excavated ulceration just within the fourchette or posterior vaginal commissure. Frequently multiple from contact infection, the lesion presents an irregular, sloughing ulceration with ragged, overhanging edges, and a granular, worm-eaten floor covered with purulent secretion. In the majority of instances the malady is associated with infection of the inguinal lymphatic glands. Infection of the lymphatic glands is one-sided, as a rule, but both sides may be involved. These glands usually become greatly enlarged, fixed, and inflamed; they often undergo suppuration, forming the typical venereal bubo.

Syphilis has long been regarded as microbic in origin and many investigators claim to have discovered the specific organism of this disease. Lustgarten, in 1884, described an organism which was regarded by the profession as the provocative agent, but this germ has never been cultivated out of the body and now is not considered to bear any etiological relation to syphilis. Many of the other views and assertions concerning the etiology of syphilis are now regarded as of historical interest only. Since the discovery of the spirocheta pallida, or treponema pallidum, by Schaudinn and Hoffmann in 1905, the convictions of the profession as to the microbic origin of syphilis are more firmly grounded. The failure of this germ to comply with Koch's law, or the conditions demanded by modern science to prove that a special germ is the specific cause of an infectious disease, still leaves some doubt as to the true etiological relation this organism bears to syphilis. Nevertheless, the uncertainty can have little weight, for the evidence of the responsibility of this germ for the production of this affliction is practically complete. The spirocheta pallida has been found in spreads taken from all lesions of early syphilis, such as chancre, secondary skin eruptions, and mucous patches, as well as in the blood, before, during, and after the appearance of early syphilitic signs. It has also been found in hereditary lesions, in the fetus, and sections taken from the internal structures; also in syphilitic lesions of inocculated apes. The organism appears as a spiral body. It measures from 6 to 12 microns in length and about one-fourth of a micron in thickness. It is composed of of 6 to 14, or more, steep turns or spirals. The ends are drawn out sharply, and frequently are provided with long, thready flagella. The special stain of Giemsa will enable one to recognize the parasite easily in carefully prepared spreads. In 1909 Burri pointed out the fact that bacteria were not stained by India ink, and, as a result, the presence of micro-organisms in a thin layer of ink could be recognized by the presence of clear areas in a dark field. This method is admirably adapted to staining the syphilitic spirocheta because of its simplicity, the cheapness of the materials used, and the ease with which the organisms are recognized in the microscopic field. Moreover, the ordinary commercial India ink, such as Guenther's, or Higgins' waterproof ink, may be used. Levaditti's method affords the best means of demonstrating the treponema in the tissues.

Syphilitic infection in woman may conduct itself just as it does in man and leave traces of its destructive action in all the vital systems of the body. Most observers agree, however, that syphilis in woman runs a milder and more concealed course. Women with advanced tertiary lesions frequently are unable to recall any annoyance of the primary or secondary stages; but this is not the universal rule, and in many cases the disease pursues a course, as it does in man, with all the primary and secondary manifestations.

The inital lesion of chancre usually appears in some portion of the vulva. It is found frequently in the region of the fourchette; appearing occasionally on the cervix uteri; and, still more rarely, may be found on the lips or nipples.

The most common type of syphilis met in women is the secondary or tertiary lesions of the vulva, manifested by vegetations, condylomata, and gummatous formations. The accompanying illustration portrays a case of the extensive syphilitic infection of the vulva of a young married woman, eighteen years old, who came under my observation in the Jefferson Medical College Hospital. Tertiary lesions in the form of gummata are not uncommon in the uterus and its appendages. A gumma in the uterine wall might be confounded with fibroid tumor. It is important to differentiate chancroidal infection of the vulva from the initial lesion of syphilis in these structures. The soft sore appears as an irregular excavated ulcer with unequal overhanging edges, and a granular, angry, worm-eaten floor covered with purulent exudate. Frequently the lesion is multiple, but never hard nor indurated. The chancroidal bubo is generally unilateral. It is large, immobile, painful, tender, and discolored. It usually suppurates. The chancre appears as a small, roundish, grayish ulcer with hard, well defined, indurated edges. It is covered with a thin serosanious secretion, and surrounded by an area of hard edema. The period of incubation and appearance of secondary manifestations will also aid in the differentiation, as well as the bilateral multiple enlargement of the inguinal lymph glands which do not attain large size, are movable, and do not tend to suppurate. Moreover, lymphatic gland enlargement is frequently found in other portions of the body. Treponema in the secretion of the sore will confirm the diagnosis and the therapeutic test will also aid in the differentiation. It is important to keep in mind the possibility of a mixed infection, in which case the chancroid will in a short time assume the character of a chancre. Treponema is here classed with the vegetable parasites, although there is doubt as to whether this organism belongs to the vegetable or animal kingdom.

76. **Bacillus typhosus** may be found in any part of the genital tract during typhoid infection, and for months, or even years, after the fever has subsided. It is found in acute infectious inflammations of the endometrium, and Pfannenstiel reported three cases of post-typhoid ovarian abscess. Several other cases have been reported. The typhoid bacillus has been found in suppurating ovarian cysts several months after the primary typhoid infection. It is probable that the bacilli reach the ovarian structure by passing through the intestinal wall. Typhoid infection of the vulva and vagina also occurs, and, according to Keen, the lesions usually occur as distinct vulvar gangrene and gangrenous ulcerations in the vagina. He collected eight cases, seven of which were in young persons from seventeen to twenty-seven years of age, and one of thirty-four years. In six of the cases there was gangrene of the labia, extending sometimes to the perineum and thigh. Fistulous communications between vagina and bowel were established. The gangrenous ulcers were commonly located on the posterior vaginal wall. Ulceration of the anterior vaginal wall is also reported, with the formation of vesicovaginal fistula. In some of the cases great distortion of the vagina developed from cicatrization, and in one case complete occlusion, resulting in retention of menstrual fluid which required operation for its liberation. Keen reported a patient under his observation with both rectovaginal and vesicovaginal fistulæ. Typhoid infection of the uterus during pregnancy frequently occurs and generally results in the expulsion of the fetus. Typhoid bacilli have been found in the placenta, and Keen studied a case reported by Freund and Levy in which spontaneous abortion occurred at the fifth month. The patient was in the declining stages of typhoid infection. Bacilli were found in the blood of the placenta, in the spleen, and in the heart of the fetus. Similar cases have been reported.

77. **Smegma bacillus** normally inhabits the secretions of the external genitals, and may be found in the urine associated with particles of detached smegma. The germ is not pathogenic. Morphologically it resembles somewhat the tubercle bacillus, but is shorter and differs tinctorially in that it is not an acid-fast bacillus, and, therefore, is readily decolorized by the mineral acids.

78. **Bacillus pyocyaneus,** a short, rod-shaped, motile organism which measures 1 to 1 1/2 microns in length by 1/2 micron in width, grows readily in nearly all culture media at a temperature of 20° C., lique-

fying gelatin, and in the process of growth the colonies assume a greenish hue. It is found in green pus and in the discharge of the intestinal disorders of infancy. It has been found in suppurative peritonitis, otitis media, endocarditis, and other affections.

79. **Bacillus aerogenes capsulatus** is a gas-producing bacillus, measuring 3 to 6 microns in length and 1 to 1 1/2 in thickness. It is truly anaerobic, grows in all culture media in chains of three and four, and generates gas and acid in the process of development. It has a distinct capsule. The germ has been found in emphysematous gangrene, in cases of emphysematous vaginitis, and in the uterus in puerperal septic infection. The distention of the puerperal uterus with gas, which sometimes occurs (physometra), is, no doubt, due to the presence of this micro-organism.

80. **Diphtheria Bacillus.** Infection of the genital canal with Klebs-Loeffler bacillus, while rare, occasionally occurs, and cases of diphtheritic infection of the vulva, vagina, and uterus are reported. Infection generally occurs during the puerperium and is implanted on injured tissues. The infectious process presents the same pathologic anatomy as noted when occurring in the throat, and responds likewise to the administration of antitoxin. The poison, when implanted upon abraded structures, rapidly generates the characteristic false membrane, which hastily spreads over the entire vagina and even into the uterus and tubes. Diphtheroid infection frequently results from the presence of the streptococcus and other pathogenic bacteria, particularly the former, following labor, but the membrane formed by the streptococcus develops in patches and is confined to abraded surfaces (Edgar); therefore, if the entire genital tract is covered by the pseudo-membrane, true diphtheria is suggested. Infection of the genital tract by the bacillus of diphtheria is usually conveyed by the attending physician, and it follows, therefore, that no case of labor should be attended by men who are at the same time caring for patients suffering with diphtheritic infection.

81. **Pneumococcus.** The diplococcus of Fränkel has been found in suppurative conditions of the female genital tract, particularly of the Fallopian tube. Andrews, in his cases collected from literature, found the pneumococcus present fourteen times, thirteen times in pure culture and once mixed with other germs. Pneumococcic infection of the genital canal, however, does not bear any definite relation to pneumonia. The infection usually has been introduced from without into the lower genital canal. The pneumococcus has been found in suppurative processes of the ovary; it has been reported to have been collected in pure culture from an ovarian abscess.

82. **The diplococcus of Siegelman** occurs in pairs and somewhat resembles the gonococcus. It is smaller and is further differentiated from the gonococcus in that it accepts Gram's stain. The germ was discovered by Siegelman in several cases of pruritus vulvæ in which there was no other demonstrable cause. Siegelman attributes, therefore, the so-called cases of idiopathic pruritus vulvæ to the action of this coccus.

83. **Collection of the fluids and secretions** is necessary to make

a positive diagnosis of certain infectious conditions and to determine the character of the specific infectious agent present, and they must be subjected to careful bacteriologic analyses. Microscopic and bacteriologic examinations of secretions and fluids from the genital tract, however, should not be the only bases considered in making a diagnosis, but should be regarded as an additional resource for establishing the diagnosis. Bacteriologic examinations of the secretions can be made with carefully prepared cover-glass spreads from the vulva, vagina, and cervical canal, and the orifices of the various communicating glands, such as Bartholin's and Skene's. Spreads should also be prepared from secretions expressed from the urethra. The preparation of the spreads should not be left to the nurse, but should be made by the physician himself. Cover-glass specimens are prepared from the vulva by transferring the secretion from the parts with an applicator provided with a small swab of sterile cotton or the ordinary platinum needle, the end of the needle proper being rolled together in order to afford a larger collecting surface. This is applied to the part containing the secretion and then transferred to the cover-glass. Specimens may be secured from the vagina and cervix in a similar manner, though material from the cervix should be obtained after exposing the cervix with a speculum, when the secretion can be collected as it escapes directly from the cervical canal. It is important in preparing cover-glass spreads to collect secretion from the parts most commonly the seat of infection, such as the orifice of the urethra, orifice of Skene's and Bartholin's glands, and from the cervical canal. In long-standing infections of the cervix the germs are found to inhabit the glands; therefore, to demonstrate their presence, the glands should be punctured and the contents collected on a cover-glass as they emerge at the site of puncture. In infecting culture media inoculations should be made with the suspected secretion from the different parts of the tract, not one part alone, and several cultures should be prepared. It is important in collecting discharges for bacteriologic examination that the patient should not receive any antiseptic douche for at least a period of twenty-four hours before the collection is made. This procedure destroys the microscopic value of secretions and, therefore, renders examination practically worthless. Cover-glass spreads can also be employed in private practice—both in office work and in outside practice. The secretions and fluids can be collected also in especially prepared glass pipets, the material being drawn into the pipets with a syringe, after which the ends of the tubes are hermetically sealed. With the secretion contained the pipets should be enveloped in cotton or other protecting material and conveyed to the pathologist for examination. It is also always important in preparing cover-glass spreads, cultures, or secretion tubes to letter or number each in order to designate the organ from which the collections were made. Fluids from cysts are sometimes collected and examined microscopically to ascertain their true character, but only in hydatid disease can we definitely assert the true nature of the lesion by finding the hooklets of the parasite. Secretions of the genital tract are, as a rule, only collected and examined to determine the presence and virility of bacteria present, although sometimes particles of benign or malignant neoplasms may be discharged, which are collected and studied intelligently, but usually only very small pieces of tissue are thus obtained, and from these positive microscopic diagnoses cannot be made. Moreover, sections of material escaping in secretions are generally so altered by necrobiotic processes that the recognition of their true character is necessarily rendered extremely difficult.

ANIMAL PARASITES.

84. **Pediculosis pubis or inguinalis,** the ordinary crab louse, is generally found in the hair of the pubic region, sometimes in the axilla, and occasionally in the eyebrows. Careful examination will reveal the parasite near the roots of the hairs, with its head downward buried in the follicle. The spores will be found deposited on the hair shafts. In the pubic region this parasite is responsible for intense pruritus, resulting in hyperemia and excoriation from scratching.

85. **Acarus scabiei,** the itch-mite, while found on the tender skin areas of the body, is frequently present in the skin of the lower abdomen and vulva, inducing intense itching with excoriation and abrasions of the skin from constant scratching.

86. **Oxyuris vermicularis,** the ordinary seat or pin worm, inhabits the colon and rectum. From these regions it wanders to the vulva and vagina and may wend its way into the interior of the uterus, Fallopian tube, and ovaries. Mano, quoted by Andrews, reports a case of a large cyst of the ovary and two small cysts of the tube in which were found the eggs of this parasite. He believes that the parasite reached the tube and ovary by traveling from the rectum, the vagina, and uterus. The pin worm is found at all ages, but commonly in children. The parasite causes intense pruritus, which is always worse at night, due to its nocturnal migration. From the itching and scratching, excoriations and inflammation of the vulva result, and even perirectal abscesses may form.

87. **Ascaris lumbricoides,** the ordinary round worm of the intestinal canal, is the most common animal parasite found in human individuals. It usually occurs in children and occupies generally the upper portion of the small bowel. From this region they migrate through the various channels connected with the alimentary canal, and even penetrate the intestinal wall. Cases are recorded where they have completely occluded the biliary passages, and traveled through the Eustachian tube and projected from the external ear. They have been found in the vagina, uterus, tubes, and free in the pelvic cavity. J. H. Koch found the ascaris in an abscess in the pouch of Douglas. The portal of entry was through a fistulous communication from the rectum. Bizzozero found the ascaris in the right Fallopian tube; the parasite had entered the tube by traveling through a perforation in the rectal wall.

88. **Tænia eichinococcus, or dog tapeworm,** is a parasite inhabiting the intestinal canal of the dog and wolf. The adult worm is composed of five segments. The first segment is slender and continuous

with the head; the second is the shortest; and the posterior segment, the longest, is frequently more than half the length of the parasite. The adult worm is not found in the human individual. The larvæ of the parasite are taken into the alimentary canal of the individual, or in the female they may enter also by way of the vagina. When conveyed by the alimentary canal the embryos are hatched and these wander into the tissues of various organs, forming the hydatid cyst. In Iceland, where human beings and dogs live together in closely confined quarters, echinococcus disease is endemic. The liver is the organ most frequently affected, being involved in 50 per cent. of the cases. Echinococcus cysts may develop in any part of the body. The disease is more frequent in women than in men, and Finsen found that in two hundred and forty-five cases 70 per cent. occurred in women. In the pelvis the disease is usually situated in the cellular tissue of the posterior pelvis and also in cellular tissue anterior to the uterine body. Cases have been reported where the cysts have developed in the uterine body proper. Hydatid disease develops in the Fallopian tube, and Doleris collected from literature eighty cases of hydatid disease of the tube, one of which (his own) was possibly primary in the tube. Primary echinococcus infection of the ovary is rare, though a few cases have been reported. The diagnosis of this condition is made positive by finding the hooklets or scolices. A cystic tumor containing fluid of comparatively low specific gravity (1005 to 1012) and nonalbuminous, or presenting only a slight trace of albumin and neutral in reaction should be suggestive of echinococcus disease.

BLOOD EXAMINATION.

89. The Blood. Systematic and careful examination of the blood in certain gynecological conditions will reveal special clinical facts which cannot be elucidated by any other means. Gynecological diagnoses, however, must be made by utilizing all clinical methods of examination. Too much value should not be attached to one plan alone. I feel it important to emphasize the fact that superficial blood examination should never be made, as the knowledge thus obtained is also superficial, and of little practical value. Examination should comprise the determination of the number and character of red blood cells; the number, character and relative proportion of leukocytes; an estimate of the hemoglobin percentage; in certain cases, the presence or absence of parasites; and the serum reaction. This plan of examination would meet all practical requirements, but a more complete examination, of scientific rather than practical interest, would consist in the estimation of the specific gravity; the determination of the alkalinity, coagulability, and toxicity; and spectroscopic revelations. The methods of collection and the various instruments used in examination are fully described in special works on hematology, such as Da Costa's, Cabot's, and others. The lengthy description of such methods and implements would require too much space in a work of this character.

It is important to recall that all the vital structures and fluids of the body are profoundly disturbed by various lesions in the pelvis, and, after the nervous system, perhaps none more than the blood. From the advent of the first menstrual period to the climacteric, a succession of changes takes place in this fluid. A reduction in quantity and quality of the blood frequently occurs in young girls just before or during the first years of menstrual life, giving rise to a primary anemia known as chlorosis or green sickness. This condition is frequently responsible for disorders of this function. Marked disturbances in the blood are constant in pregnancy, and in the various pathological types of this condition. More or less blood destruction is observed in women suffering with uterine fibroids—particularly of the submucous type. Alterations in the quantity and the quality of the blood are constant in malignant disease of the genital canal; especially in cases of uterine cancer and chorio-epithelioma. Indeed, in the latter condition, the patient may appear almost bloodless.

It will be found that the revelations of careful blood analyses not only aid us in establishing a positive diagnosis and indicate the prognosis, but also help us to adopt methods of treatment, either medical or surgical. The medical treatment of pelvic disease would not be complete without the institution of measures to improve the condition of blood. It is a question whether many of the displacements of the uterus or benign pelvic affections are not due frequently to blood starvation with a consequent loss of muscle tone. This would seem true because it is not unusual to see pale, flabby, weak, debilitated women suffering with marked displacements of the uterus to whom operation offers apparently the only method of relief; yet, after careful rest, restoration of the qualtity of the blood, and improvement of the general health, we find the uterus assume its normal health and position. The disorders of the menstrual process manifested by scanty and painful flow, especially in young women during the early period of menstrual life, are commonly associated with some type of anemia, particularly chlorotic anemia. It is gratifying to observe that measures directed to correct this condition will in the majority of cases bring about a healthy performance of this function. As a matter of practical surgery, it is decidely important to obtain full knowledge of the blood quality before instituting operative measures, because, by the information thus gained, the surgeon is better able to determine the relative resistance of the patient, the probable character of her convalesence, and the possibility of vicious or faulty union of operative surfaces. It is a well known fact that in the presence of marked anemia the danger of shock and general or local wound infection is much greater; convalesence more prolonged, and union more tardy, than when this condition does not exist. I believe that many cases of suppuration after operation are due to pre-operative anemia and the absence of the elements necessary for rapid and complete union. I recall one case of marked anemia due to uterine cancer. There was no attempt to repair eleven days after operation, and on the removal of the sutures, the abdominal incision gaped wide open allowing the intestines to protrude. The statement is justifiable that it is unwise to operate when the red blood cells are greatly reduced and the hemoglobin below 30 per cent., but, unfortunately, we are sometimes compelled to interfere when the blood condition is worse than this—frequently with unhappy results.

90. **Leukocytes.** For diagnosis and prognosis one of the most important disclosures of a blood analysis is the number and relative proportion of the white cells. An increase of the total number of leukocytes is always more or less constant in pelvic inflammatory disease. Pankow believes that a leukocyte count of 10,000 indicates suppuration in the adnexa, if other causes be eliminated. I have come to regard a leukocyte count of 12,000, or over, as indicative of suppurative affections of the appendages, and rarely have been mistaken. In forty-six cases of acute pelvic inflammation I found a leukocyte count to range from 12,000 to 31,000. Da Costa found in thirty-four cases of pelvic abscess, ovarian abscess and pyosalpinx an average count of 15,548. Dützman reports 232 gynecological cases in which 2,000 counts were made; in ninety of them pus was revealed by this means, when the probability of its existence was not made evident by other tests, including palpation under narcosis. H. C. Taylor, in thirty-two cases of pyosalpinx, found a marked leukocytosis in all. He relies on the polynuclear count as the most valuable indication of pus, ranging from 80 to 90 per cent. in fifteen cases, and 75 to 80 per cent. in seven cases. There is no doubt that the relative percentage of the polynuclear cells is of more importance than the knowledge of the leukocyte count alone, in determining the presence of suppuration. It is well to remember that the increase in the number of the white cells will depend upon the degree and limitation of the suppurative process. If an abundance of the toxic material is absorbed from the pelvic lesion and the resistance of the patient is good, the count will be high. On the other hand, if the lesion is enveloped by a nonabsorbing inflammatory wall, and the resistance of the patient is poor, probably the count will be low. In malignant disease, also, the white blood cells are increased, but, according to Julliard, this does not take place early. When ulceration and necrosis occur in malignancy, leukocytosis develops with the absorption of toxic matter from the affected parts. The effect of malignant disease on the leukocytes will depend on: (1) the position of the tumor; (2) its size; (3) the rapidity of its growth; (4) the occurrence of metastases; (5) the resisting power of the individual, and (6) the degree of necrotic change. In cancer of the uterus, as a rule, the leukocytes are slightly increased. In seven cases reported by Cabot, a leukocytosis which ranged from 16,800 to 34,000 was observed in five. No decided alteration was noted in the number and characer of these cells in the two remaining cases. It may be said, however, that malignant leukocytosis is generally low and, according to Da Costa, counts of less than 20,000 are the ordinary rule. Malignant leukocytosis is commonly most pronounced in sarcoma.

91. **Bacteremia** is defined as the presence of micro-organisms in the circulating blood. Normally the blood is regarded as bacteria-free, yet recent investigations show that even under normal conditions bacteria exist in the blood. The condition has been denominated "latent microbism." This mild bacteremia is wholly consistent with health, because

the bacteria present are small in number and not virulent, and, therefore, cannot do harm unless the individual is weakened in resistance and the bacteria multiply and become virulent.

Bacteria found in Blood. A large number of bacteria have been isolated from the circulating blood. Among the most important are:

1. The pyogenic bacteria.
    - (*a*) Staphylococcus pyogenes.
    - (*b*) Streptococcus pyogenes.
    - (*c*) Gonococcus.
    - (*d*) Pneumococcus.
    - (*e*) Diplococcus intracellularis meningitidis.

Other bacteria found in the blood are:

Bacillus anthracis.
Bacillus coli communis.
Bacillus influenzæ.
Bacillus lepræ.
Bacillus mallei.
Bacillus pestis.
Bacillus tetani.
Bacillus tuberculosis.
Bacillus typhosus.

Besides these vegetable parasites, certain animal parasites are found in the blood, the most important of which are the malarial plasmodia, the embryo of the filaria, and spirilla of Obermeyer.

92. **Blood Culture.** The blood secured for bacteriologic examination should be aspirated by puncturing a superficial vein which has been exposed by an incison, and not by puncturing the vein through the skin. Examination of prepared cover-glass films is unsatisfactory. In obtaining the blood the veins in front of the elbow-joint (median basilic or median cephalic) may be selected. The tissues of the part should be thoroughly sterilized in order to rid them of the common dermal bacteria. According to Da Costa, fluid culture media are preferable to the solid. One-half cubic centimeter of blood should be drawn for each culture, and about one hundred parts of media to each part of blood should be used. A special needle can be secured for withdrawing the blood (Fig. 110), but in an emergency a sterile antitoxin or hypodermic syringe may be employed.

THERAPEUTICS.

93. **Classification.** The treatment of gynecological cases may be medical, electrical or surgical; the first being general or local. Naturally the subject comprises the consideration of preventive medicine and the discussion of both palliative and radical measures for the eradication of disease or the amelioration of its distressing effects.

94. **Medical Treatment:** general or constitutional measures. In the investigation of every patient suffering from symptoms which indicate genital disease, it is important that the condition and actions of the various

organs of the body should be studied carefully. The disorders of one structure of the body should not be treated as if it were not an integral part of the whole, incapable of producing disturbing influences on organs near or remote; nor having its functions unbalanced by disease in the organism without its immediate environment. Renal, hepatic or cardiac disease and arteriosclerosis, by increasing vascular tension, disturb the menstrual function, causing the unobservant to subject the patient to futile local and operative measures. Engorgement of the liver and consequent obstruction of the pelvic circulation must be relieved by suitable measures. Pelvic engorgement from defective cardiac action demands measures to increase the activity of the heart's action and so facilitate elimination. Increased vascular tension from arteriosclerosis, with or without renal lesions, indicates the employment of the iodids and nitrites, careful regulation of the diet, the promotion of the secretions and the judicious use of baths. If the kidneys are unable to eliminate sufficient morbid material, the skin and bowels must do additional work. The advent of such conditions is frequently so insidious that the action of the kidneys should be determined by a careful examination of the urine as a preliminary to every operative procedure. Such an examination should comprise the specific gravity, quantity of urea, chemical contents as albumin, sugar salts, and approximate quantity of solids. Microscopic examination should be a routine part of such an investigation. It discloses the character of crystals and casts, their number and appearance; the quantity and variety of blood corpuscles and desquamated epithelium; the existence of pus corpuscles, amount of mucus, and presence of disintegrating tissue and micro-organisms. Investigation prior to surgical measures should include the performance of the respective functions of the heart and lungs and a study of the blood. The necessity for operation will be determined by knowledge of the number of leukocytes, its wisdom, by the number and variety of erythrocytes and the amount of hemoglobin. A low percentage of hemoglobin does not preclude operation. I have performed hysterectomy on a patient who recovered in whom hemoglobin was but 16 per cent. But, a low percentage, associated with a subnormal number of erythrocytes, presents an unfavorable condition for prompt healing of wounds and renders the individual less resistant to infection. Frequently judicious general treatment may render a subsequent operative measure successful or may so improve the restorative processes as to render it unnecessary.

The alimentary canal as the sluice-way of the system should receive first consideration, not only as to its evacuation but as to the material placed within it. Inflammatory conditions are cut short by abstinence and depletion; chronic disorders benefited by increased nutrition; and the growth of some neoplasms are arrested by deprivation of food containing their principal constituents. The intestinal tract should be swept out occasionally by a brisk purgative and efforts made to keep it in a good condition by careful adjustment of the diet. Twice a week the patient may be given calomel (gr. ss) to be followed the next morning by a Seidlitz powder, Rochelle or Epsom salts, or phosphate of soda (℥ii).

Frequently patients are advised to take compound licorice powder at night, or a wineglassful of some laxative water in the morning with temporary beneficial effect, but all such measures sooner or later enslave the victim, and the aim should be to free the patient so far as possible from the habitual employment of drugs. In sluggish liver, frequent application of hot water is of value which may be enhanced by the addition of three ounces of nitro-hydrochloric acid to the gallon of hot water. Ammonium chlorid or potassium iodid internally and largely diluted are frequently beneficial. Efficient elimination by the kidneys should be promoted by inhibition of large quantities of water and the use of diuretics; where inefficient, want of action should be compensated by increased activity of the bowels and skin. The frequent existence of anemia demands the administration of reconstructives as quinin, strychnin, arsenic, mercury, the bitter tonics and, after proper preparation, iron.

The profound effect of pelvic diseases on the nervous system renders the employment of the antispasmodics acceptable. Valerianate of zinc, asafetida and the bromides will afford temporary relief. Nervous and anemic patients will be benefited by the cold pack followed by massage. The state of the stomach, the heart's action, the character of the respiration and the general nutrition should always receive consideration.

95. Specific Remedies. It is difficult to suppose that remedies will have a distinctly selective influence on the uterus only. Those which have been so regarded are ergot, cotton root, corn fungus, hamamelis, hydrastis canadensis, cotarnin hydrochlorat, cannabis indica and viburnum prunifolium.

Ergot and the remedies exerting similar action are generally given in hemorrhage. Its beneficial action is obtained in two ways: 1. by stimulating the nonstriated muscle fiber of the blood-vessels and increasing the rapidity of the circulation; and 2. by direct action on the uterine muscle, compressing the blood-vessels and promoting the extrusion of a neoplasm from the walls as a foreign body. Ergot in combination is generally more satisfactory than when used alone:

℞. Ext. ergot.................................. ℥j
Ext. hamamelis,
Tr. cinnamoni..............................āā f℥ss M.
Sig.—f ʒj every two or three hours.

Painful contractions can be ameliorated by combining with each dose of the above one to two drops of fluid extract of cannabis indica.

℞. Ergotin.................................... ... gr. ij
Cotarnin hydrochlorat .... gr. j
Atropin.. gr. 1/600
M. ft. capsule No. 1.
Capsule No. XXX.
Sig.—One capsule four times daily.

It must be borne in mind that all these remedies acting on the muscular coat of the vessels increase arterial tension, and consequently will increase rather than diminish bleeding. It would seem more sensible to place the patient in bed, tampon the cervix or vagina and administer nitrites to diminish blood pressure, thus allowing the vessels to become occluded.

Hamamelis and hydrastis undoubtedly owe their action to the large amount of tannic acid they contain. Hydrastin or hydrastinin, in doses of from 1/8 to 1/4 of a grain, is more effectual in controlling hemorrhage than the fluid extracts.

Viburnum prunifolium has been greatly vaunted as a remedy for the relief of dysmenorrhea or the arrest of threatened abortion, but I have never been able to obtain any perceptible value from its use.

The extract of thyroid gland seems to exercise a specific influence upon the uterine mucous surface. In women who are very obese and have associated with the condition amenorrhea, or very scanty flow and sterility, the administration of the thyroid extract, in addition to the reduction of flesh, increases the flow, and frequently appears to overcome the sterility. The late Dr. E. H. Coover, of Harrisburg, found thyroid extract very effective in allaying the pain of advanced carcinoma of the uterus. He also thought that it had an influence in delaying the progress of the disease. This opinion seems in harmony with the observations of Beatson and others in carcinoma of the mammary gland.

Thyroid extract is frequently of value in producing an improvement in the conditions which occasion uterine hemorrhage, whether these be from interstitial endometritis, submucous fibroma, or carcinoma. Marked changes in the nutrition and the reduction in the size of myomata have been claimed for the use of this drug, but experience does not seem to justify them.

Adrenalin, or extract of the suprarenal gland and tablets of ovarian extract, or, better still, lutein tablets made from the corpus luteum, are efficient through their action upon the involuntary muscular fibre, exerting a decided influence upon the uterine circulation. They are, consequently, valuable additions to our armamentarium for the control of hemorrhage.

Apiol and the manganese salts cause a hyperemia of the uterine mucous membrane, as indicated by increased normal menstrual flow and its return in amenorrhea.

96. Rest and Exercise. It is very difficult to fix definite rules to guide a patient as to the amount of either rest or exercise she should take. What one person may regard as a pastime another will consider violent exercise. Women with inflammatory or engorged uteri are benefited by certain hours of rest each day. The recumbent position permits the blood-vessels to secure relief. Not infrequently relief is enhanced by elevating the foot of the bed or by resting the pelvis upon a firm pillow. In predisposition to hemorrhage from fibroid growths, the patient should be kept in bed for a few days prior to and during the menstrual period. Rest is obligatory in all acute inflammatory troubles. Some patients will, however, have to be stimulated to take exercise; they are disposed to go to bed on the slightest provocation, and remain so long that their muscles become flabby and the vessels grow feeble; the patient becomes bedridden, and every effort of exertion is attended with real or imaginary pain. Such patients may require resort to massage and electricity to enable them to resume their ordinary duties.

Judicious use of the bicycle, encouragement to play golf, automobile and carriage riding and systematic exercise will be found most valuable auxiliaries in nervous patients who are dominated by imaginary aches and pains. The increased oxygenation and elimination without doubt free the patient from the cause of her distress.

97. Baths. The external employment of water, whether as partial or complete baths forms a valuable adjunct in the treatment of pelvic disease. Heat and cold are applied readily thus to a large surface and, through the enhanced activity of the circulation, are transmitted to the deeper structures. The heat of the body or of an inflamed part thus can be rapidly abstracted. Blood pressure may be increased by cold and reduced by hot bathing. The former is stimulating and tonic and the latter depressing and eliminative. The cold bath (55° to 75° F.) is preferably taken in the morning. The patient remains in it from a few seconds to a minute. It is followed by a brisk rub with a coarse towel, and active exercise, by which the skin surface experiences a warm glow and the individual has a sensation of exhilaration. Weak and anemic patients do not react, hence are unsuitable subjects.

Tepid baths (75° to 95° F.) can be employed in the less resisting and is slightly tonic when not prolonged beyond two or three minutes. If continued for a longer period they become depressing. The warm bath (95° to 105° F.) is sedative and should be taken at bedtime, and may be continued for five to ten minutes. A longer period produces relaxation. The hot bath (105° to 120° F.), also preferable at bedtime, may continue fifteen minutes. The skin becomes very red. If the bath is prolonged, the patient may become very much relaxed and depressed. The bath may be sufficient to envelop only a portion of the body. The uncovered portion of the body is bathed with friction, preferably by an attendant. It is very efficacious in reducing temperature.

98. The Sheet Bath and the Wet Pack. Nervous and anemic patients are greatly benefited by being placed in a cold wet pack and covered with blankets. The heat is soon engendered and after the patient has been kept in it for an hour or more the pack should be removed, the surface dried with friction, and active massage employed. The patient becomes quiet, composed, and inclined to sleep. The patient enveloped in the wet sheet may be subjected to friction through it. The procedure deepens the respiration and consequently promotes oxygenation.

The wet pack, according to Baruch, is applied by covering the mattress, or, better, a cot, with a rubber blanket and over this a woolen one. A large coarse linen sheet is wrung out of water at a temperature of 60° to 70° F., spread on the blanket, and so placed that it will extend two feet or more beyond the patient's feet. The patient, wearing a wet turban, now lies on the cot with her arms extended above her head, covering the junction of the middle and right third of the sheet. The latter is drawn across the body from right to left and tucked along the left side of the body. The arms are now placed at the sides of the body and the left side of the sheet is carried over them and tucked along the entire right side, the blanket in reverse order. Care is exercised to exclude air thoroughly with the blanket. If the patient is chilly, other blankets may be applied. This method continued for a length of time is an efficient method of eliminating toxins. The wet pack is of value in nervous and hysterical cases when followed by massage. The nervous patient is greatly calmed by the procedure and may secure refreshing sleep while in the pack. It is of especial value in chronic cases characterized by defective tissue metamorphosis. When desired, the pack may be a partial one limited to the portion of the body on which it is desired to exert an especial influence.

99. **The Nauheim bath** has long been noted for its influence in heart lesions, and has the advantage over fresh-water baths that the chemical of the salts renders unnecessary the friction employed in the former, when less than the temperature of the body, and the processes of metabolism engendered are more prolongled. The baths are given at a temperature varying from 95° to 80° F. and may vary in duration from eight to twenty minutes. The action of the carbonic acid is especially beneficent. According to Bandler, who has employed it largely in hospital and private practice, its results include: slowing of the pulse rate, increased secretion of urine, increased oxidation, increased metabolism and breaking down of old tissues; regulation of the circulation and even distribution of the blood through the various structures of the body; increased demand for nutrition; building up of healthy tissue; resorption of exudates; relief of congestion, and stimulation of the nervous system and trophic centers.

It will be understood readily that baths capable of producing such marked changes should be given under the observation of a physician. As care must be exercised not to overtax the functional energies of the body, each bath should be followed by exhilaration. Bandler advises them in cases of insufficient development associated with amenorrhea and dysmenorrhea; in uterine catarrh indicated by a lack of tonicity of muscular and vascular structures; in inflammatory metritis and subinvolution prior to marked interstitial hypertrophy; in many cases of sterility from latent subacute salpingitis with or without cob-web closure of the abdominal end of the tube; in cellulitis and inflammatory infiltrations of the pelvic connective tissue prior to sclerosis; in local pelvic subinvolution and general subinvolution associated with gastro-enteroptosis, and movable kidney; either before or after operation for the removable of exudation; for the promotion of involution post-partum; in cases of obesity accompanied by diminution of the regular menstrual flow; in neurasthenic states at the climacteric which are not complicated with hemorrhages; and, finally, in rheumatic or gouty conditions.

The baths may be improvised by adding to thirty gallons of water three to five pounds of sea salt, two to four ounces of calcium chloride and a half box of Triton salts, the water at a temperature of 95° F. and the duration of the bath eight minutes. Following the bath, the body is dried with warm towels, the patient given a cup of hot milk or weak tea and kept in bed for an hour. The baths should be given in the morning at least two hours after a meal and with each set of three there should be an increase of the salts, until with the last, the bath should contain from eight to ten ounces of calcium chloride and one box and a half of Triton salts, at a temperature of 85° to 80° F. and should be continued eighteen to twenty minutes.

100. The hot air bath has long been recognized as a valuable means of promoting elimination. The patient can remain in a room raised to a temperature of 130° to 160° F.; sit in a cabinet over an alcohol lamp; or have the frame placed over her as she is recumbent, and direct the heat from a lamp at the side of the bed. Where a cabinet is not at hand, the bath can be improvised by covering the patient with blankets—preferably with a rubber blanket or mackintosh externally—and conveying heat from an ordinary lamp by means of an elbow of stove pipe.

101. The Electric Light Bath. Where the room of the patient is provided with an electric current, the electric cabinet presents a ready method of applying heat. It can be in the form of a cabinet in which the patient sits, or a hood supplied with a dozen or more lights which can be placed over the body of the patient as she lies in bed. The extremities are covered with blankets. The hot-air bath, however applied, causes perspiration, increases the activity of the skin, and thus favors elimination. It proves efficacious where there is marked vascular tension from arteriosclerosis and especially in defective renal action.

102. Sea bathing has the great advantage that it can be made a diversion and the patient has the stimulus of an exhilarating atmosphere. The shock of the cold, the exercise obtained from swimming, struggling with and being buffeted by the waves are valuable factors. Unfortunately the patient is tempted to remain too long, when the exhaustion and failure to react overpower the beneficial results. Properly employed, it is efficacious in hastening convalescence after operation, in hastening the absorption of exudates and promoting nutrition. Care should be exercised as to the temperature of both air and water, better results being obtained in clear weather. The patient should be advised to plunge in and get under the water at once; at the first bath to remain in but five minutes and to come out as soon as there is any evidence of want of reaction. She should change her apparel immediately on coming from the bath and not parade the beach in wet clothing. Prolonged bathing, severe chilling of the surface and great fatigue but serve to aggravate existing conditions.

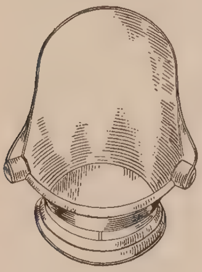


FIG. 111.—Sitz Tub

103. The Sitz Bath. The partial bath in the Sitz tub affords an opportunity of directing the energies of the bath to the structures most affected. It is capable of affording great relief in inflammatory and congested conditions of the pelvis. This bath carbonated is of especial value. The bath should be followed by rest. It would be contraindicated where there was a tendency to hemorrhage or in possible pregnancy.

104. **General massage** affords an effective means of promoting nutrition and of improving the condition of patients suffering from chronic pelvic troubles. It increases the number and the activity of the red blood-corpuscles, carries oxygen to the remote tissues and organs, facilitates oxygenation and combustion, and favors absorption. Best of all, it improves the nerve tone. Many patients are incapacitated by illness, by aggravated pains, or by disinclination to take exercise. Judiciously regulated massage accomplishes the constitutional changes ordinarily effected by exercise, free from its possible deleterious influences. Slowly the individual is rehabilitated, and as she gradually and insensibly resumes her self-control, she is emancipated from the preëxisting unfortunate nerve phenomena.

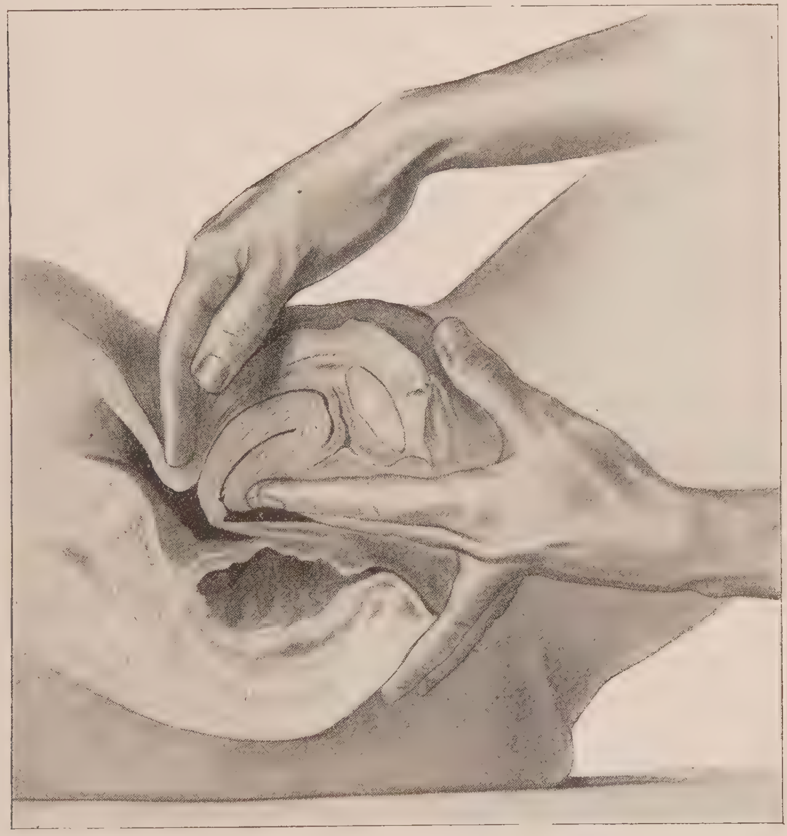


FIG. 112.—Position of the Fingers in Pelvic Massage.

105. **Pelvic Massage.** The beneficial results of massage in local inflammations of joints and superficial portions of the body justified the hope that it might be practised with advantage in the conditions of acute

and chronic exudations within the pelvis. It has been systematized into a recognized procedure, known as pelvic massage, largely through the study and experiments of Thure-Brandt, a Swedish masseur.

It is practised by having the patient lie upon her back upon a couch or table, with her buttocks close to its edge; the limbs are flexed upon the body. One or two fingers of the left hand are introduced into the vagina, with which the uterus is gently pushed forward against the anterior abdominal wall. The fingers of the right hand are placed upon the abdomen, and are moved in a circulatory or rotatory manner over the surface, or, rather, moving the surface with them in this manner. (Fig. 112.) The greatest gentleness must be exercised in the beginning, increasing the pressure as the patient becomes reassured or as the pain is lessened. As we progress, the fingers may be made to dip down, to push off and separate adherent organs, and to follow lines of cleavage indicating inflammatory adhesions. The séances vary in length from five to fifteen minutes, the shorter time being preferable in the earlier applications, and they should be repeated from three times weekly to once daily. The exercise of this procedure will be found to produce a rapid alteration in inflammatory accumulations, setting free the uterus and its adjacent organs. The procedure will be indicated in all subacute and chronic inflammations of the pelvic organs unassociated with pus-formation; in displacements, when fixed by inflammatory adhesions; in subinvolution and hypertrophy of the uterus from chronic interstitial inflammation; and in relaxation of the pelvic floor induced by increased weight of the pelvic organs.

It is contraindicated in the presence of pus-formation, whether contained in the tubes or within the pelvic tissues.

Massage is rendered difficult by thick abdominal walls, and in nervous, hysteric women. In the latter, however, much may be done by gentle procedure until the patient's confidence and coöperation are secured.

106. The Douche. The value of the hot douche was emphasized by Emmet. It should be given with a gravity syringe while the patient is in a recumbent position; the more prolonged, the larger the quantity, and the higher the temperature (116 to 120° F.) the more enduring will be its effect. The ordinary fountain syringe, a large vessel with a tube leading from its lower end, or an ordinary pitcher with a rubber tube carried to and held at its bottom by a weight may be used. Instead of the ordinary rubber, wooden or metal nozzle, a glass end piece is preferable as it can be cleansed more easily. When desired, the water may be medicated with such astringents as alum, sulphate of zinc, acetate of lead, hydrastis, or hamamelis; or, with antiseptics, as boric acid, carbolic acid (2 to 5 per cent.), formalin in normal solution (1–1500), or permanganate of potash (1 to 2 per cent.). The difficulty of protecting the clothing from stain renders the use of the last agent less frequent. Creolin (1 to 4 per cent.) and acid sublimate (1–5000 to 1–2000) are valuable. The antiseptic injections are of especial value in vaginal discharge, more particularly when of a specific character.

The advent of menstruation is considered a contraindication to irrigation, but the douche may be resumed before it ceases, particularly when the odor is offensive or the parts are irritated, using salt solution at a temperature of 100° F. Frequently the douche of cold salt water will be more effective than the hot, but its employment will depend on the reaction of the patient. It is more preferable in plethoric than in anemic patients. If the vaginal discharge is particularly offensive, as in malignant disease, a douche of thymol solution, 1 or 2 per cent., is a more excellent deodorizer.

Astringent douches are used in excessive vaginal secretion, but should not be used when the patient is wearing a pessary, as the salts are deposited upon the instrument, roughen its surface, and thus increase the irritation.

Rectal douches may be employed to cleanse the bowel and for the relief of inflammation of the rectal mucous membrane or for their effect upon the neighboring pelvic organs. The close proximity to the uterus and broad ligaments, and the ability to retain the fluid longer in contact, make the use of the rectal enemas of hot water of especial value. Medicated enemas are used to unload fecal accumulations for the relief of tympanites, and to medicate local inflammations.

Vesical douches, medicated or of plain salt solution, are used for the relief of inflammatory disease of the bladder and urethra.

107. External Applications. Hot applications in the form of poultices have been the popular form of treatment for acute inflammatory conditions, but a far more efficient means of allaying pain and of limiting the area of inflammation will be found in the ice-bag. Its persistent application will secure resolution in what would otherwise prove a serious disorder. Often the cold may be combined with soothing measures by applying a compress wet with a solution of lead water and laudanum and over this an ice-bag. The ice-bag over the sacrum gives prompt relief in dysmenorrhea of the congestive form.

108. Counterirritants are of especial value in chronic forms of disease. The skin of the lower abdomen can be painted with tincture of iodin continued so long as the skin will bear repetition. The irritation can be increased by the addition of croton oil, as in the following prescription:

℞.	Ol. tiglii,	fʒj	
	Tr. iodi,	fʒij	
	Ætheris,	fʒv.	M.

Sig.—Apply with brush externally.

A crop of pustules are produced which should be allowed to dry before a repetition of the application.

The most effective procedure is the application of a blister over the seat of pain or to the inflammatory exudate two or three times a month, but this should not be practised when the patients are much depressed or very anemic.

109. Bloodletting, or the general abstraction of blood, is now rarely practised. Doubtless there are many cases in which a good bleeding would cut short a severe illness or abort an inflammatory attack. The local abstraction of blood by the use of a scarifier or by puncturing the cervix will often prove effective in relieving the pain of engorgement and in promoting absorption and resolution of inflammatory conditions. The beneficial effect can be enhanced further by the previous or subsequent employment of the hyperemic glass.

110. **Local applications,** formerly, as the routine treatment were: the introduction of solid silver nitrate into the uterine cavity, the use of fuming nitric acid, and other powerful caustics. Such treatment cured by destroying the glandular tissue of the part. Milder measures are practised now. It should be an accepted rule that no intrauterine medication be employed unless the uterine canal is freely open to permit through drainage.

Intrauterine applications are made by wrapping a probe or applicator with absorbent cotton. After having been saturated with a medicinal agent, this is carried into the canal. A few drops of the solution may be introduced by a long pipet. In the use of either procedure, it is desirable that the cervix shall be opened freely and the uterus in good position. Even when the cervix is freely open, the irritation of the medication will often produce contractions causing violent uterine colic. Frequently contraction of the uterus will force the solution into the tubes, and result in severe inflammation of the adnexa—even the peritoneum. Such untoward results can be avoided by the employment of a Braun's syringe, the external end of the stem being perforated at several points in its last inch and a half and slightly roughened so that it can be wrapped with cotton. The injection of fluid saturates the cotton and brings the solution in contact with the surface without having it free in the cavity. To render intrauterine treatment of value, the plug of thick mucus which generally fills up the diseased cervix must first be removed, so that the remedial agent can enter. The agents generally employed locally may be classified as 1. antiseptic; 2. astringent; and 3. caustic.

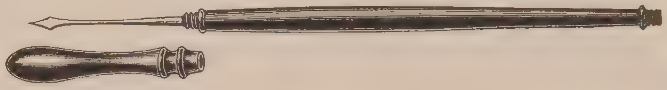


FIG. 113.—Butt Uterine Scarifier.

The *antiseptic applications* are combinations of carbolic acid, creosote, iodin and iodoform. Useful preparations are:

℞.	Acid. carbolic,	℥ss	
	Tr. iodi,	f℥j.	M.
℞.	Creasoti, Glycerin., Alcohol.,	āā f℥ss.	M.
℞.	Iodin (crystals),	q.s. ad sat.	
	Acid. carbolic. (95 per cent.),	f℥j.	M.
℞.	40 per cent. solution argyrol.		

As an astringent, a combination of tannin with iodin, as

℞. Acid tannic,.................................. ℥j
Tr. Iodi,
Glycerin....................................āā f℥j M.

The most frequently employed applications are the tincture of iodin and Churchill's tincture. Iodoform may be used in the form of crayons, as an ointment, or as a powder with an insufflator. The various astringents may be applied in powder alone or in combination with boric acid, iodoform or acetanilid.

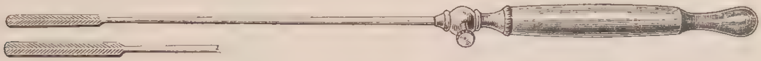


FIG. 114.—Aluminium Uterine Applicator.

The most available astringents are alum, borax, sulphate of copper and sulphate of zinc, the tincture of the chlorid of iron, fluidextract of hydrastis, and fluidextract of hamamelis. The solid substances are best used in mild solution. Some of these agents when used without dilution are strongly caustic.

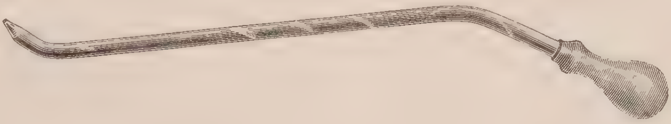


FIG. 115.—Long Glass Pipet.

Caustics. Crayons of sulphate of zinc (50 per cent.) are very effective for caustic purposes, and are used in aggravated forms of endometritis. Still more effective is the chlorid of zinc in crayons (33 per cent.).

Liquid caustics are nitric acid, acid nitrate of mercury, sulphuric acid, hydrochloric acid, chromic acid, solution of zinc chlorid, solution of silver nitrate, tincture of iron chlorid, carbolic acid, and creasote. In my judgment the more active caustics are rarely required, and very frequently their employment is followed by cicatricial changes more grave than the original condition.

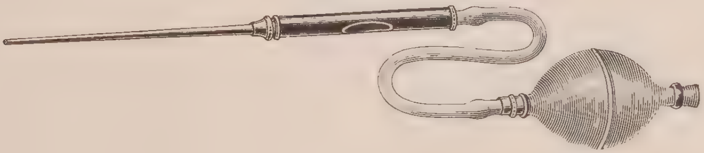


FIG 116.—Insufflator—Straight Stem.

111. Tampons are made of absorbent cotton, lamb's wool or gauze. The best tampon is composed of a combination of gauze and cotton or lamb's wool. It should have a thread attached by which it can be withdrawn. The tampon may consist of simple sterilized material, or may be medicated with antiseptics, astringents, styptics, anodynes, or alteratives. The principal purpose of the tampon is to sustain the uterus at a higher level. This relieves the patient from the dragging pains due to want of support of a heavy organ, and the change of position improves the circulation. The addition of an antiseptic permits it to be retained for a long period without becoming foul. Sublimate, from its tendency to irritate the vagina and vulva, cannot be used satisfactorily. Boric acid, carbolic acid, and iodoform are effective, but the last are objectionable because of their odor. The addition of glycerin is of value. Its affinity for the watery portions of the blood produces a profuse discharge, which depletes the vessels and favors the absorption of exudates. Boroglycerid, glycerite of tannin, and a 10 to 20 per cent. solution of ichthyol are popular applications upon the tampon, but the patient should be cautioned, in the use of the two latter, to wear a napkin in order to prevent her clothing from becoming stained.

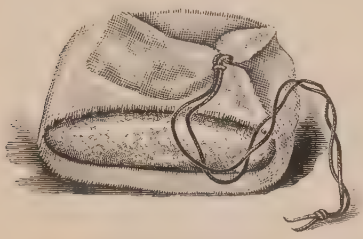


FIG. 117.—Tampon.

The tampon may be used not only to support the uterus but to control hemorrhage or discharge; to complete diagnosis, through the discharge which it induces; to assist in maintaining the uterus in a normal position, and to prepare the way for the use of a pessary.

112. Pessaries. Thirty years ago the displacements of the uterus were regarded as provocative of many distressing symptoms, which are now attributed to the complicating conditions, and the only means of relief beside the tampon was some form of pessary. As the invention of a new form of pessary rendered its inventor eligible to the title of gynecologist, they multiplied rapidly. They were divided into two classes according as to whether or not they were provided with external support. The latter were:

a. Those constructed so large that they were supported by the structures below them, as the ring, disc and ball. They served to support the uterus at a higher level and prevented prolapsus regardless of the relation of the uterus to the pelvic axis. Such instruments were necessarily dependent on sufficient retaining power of the pelvic floor to sustain them. They were made of soft and hard rubber, of glass, metal and celluloid. The soft rubber soon became permeated with the secretions and produced an exceedingly disagreeable odor. When worn for a considerable length of time, a ring of contracted tissue formed beneath the instrument, which, while insuring its retention, made its removal exceedingly difficult, and, in the case of the glass balls, very dangerous. The latter have been broken in attempted removal and injuries resulted which lead to vesical and rectal fistulæ. The late Dr. Levis, when such a pessary broke, filled the vagina about it with soft plaster of Paris, and when the latter hardened, delivered the mass. My colleague, the late Dr. Warder, constructed a pair of fenestrated forceps locking them after the blades were introduced separately, with which he accomplished the delivery; but, by passing two fingers of one hand into the rectum above the pessary and stretching and pushing back the vulva and vagina with the fingers of the other, the pessary can be delivered safely.

b. Instruments shaped to the axis of the pelvis, as the Smith-Hodge, Munde, Thomas and Schultze pessaries, are used to maintain the uterus in a proper position. They are principally used for retrodisplacements, and are of particular value when the condition is recent and due to the weight of a subinvoluted uterus. They act by traction on the posterior vaginal fornix, which by pulley-like action over the posterior bar of the pessary pulls up the cervix and, as a consequence, the fundus falls forward. By supporting the heavy uterus at a higher level they are capable of affording comfort in anteversion and prolapsus.

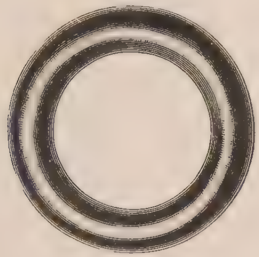


FIG. 118.—Ring Pessary.

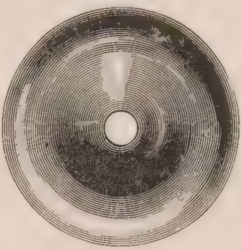


FIG. 119.—Disc Pessary.

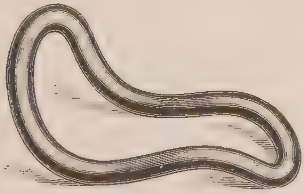


FIG. 120.—Smith-Hodge Pessary.

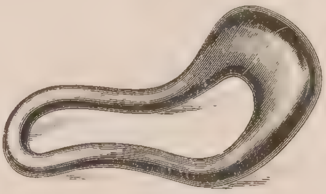


FIG. 121.—Munde Pessary.

c. Pessaries which combine conformation to the form of the pelvis with the size to secure retention, as the Hoffman, Fowler and Zwank pessaries. The Hoffman, and Fowler are made of soft rubber. The Zwank has a stem and two wings, and can be separated after insertion, but these

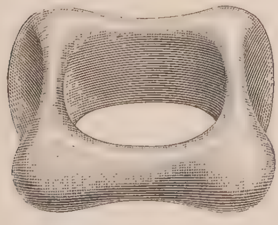


FIG. 122.—Hoffman Soft-rubber Pessary.

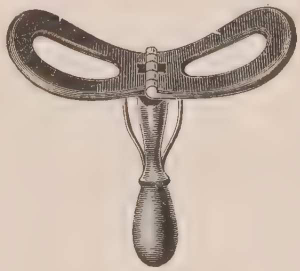


FIG. 123.—Zwank Pessary.

pessaries afford such great opportunities for the retention of decomposing secretion that they are very objectionable.

d. Instruments designed to prevent prolapse of the anterior vaginal wall, as the Gehrung, Grailey, Hewitt cradle pessary, and the Thomas anteversion pessaries, require a firm support from the muscular structures of the pelvic floor to be serviceable.

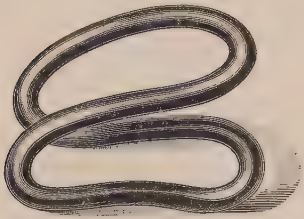


FIG. 124.—Gehrung Pessary.

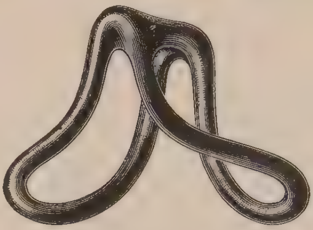


FIG. 125.—Hewitt Cradle Pessary.

e. Intrauterine stems and drainage tubes have been devised to maintain a canal of the uterus and permit a readier exit for its discharge. They have been employed with much success in dysmenorrhea, dependent on obstruction from marked flexions and contractions of the uterine canal. The instrument must be worn for several months, and like all foreign bodies is prone to produce endometritis and a profuse discharge.

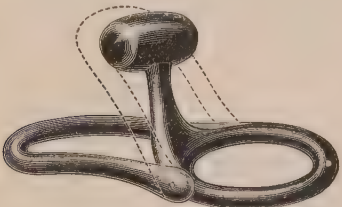


FIG. 126.—Thomas Anteflexion Pessary.

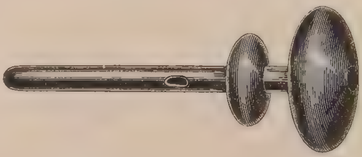


Fig. 127.—Stem-pessary.

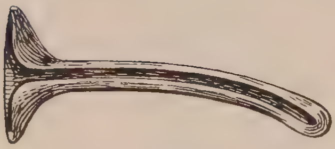


FIG. 128.—Wylie Drain.

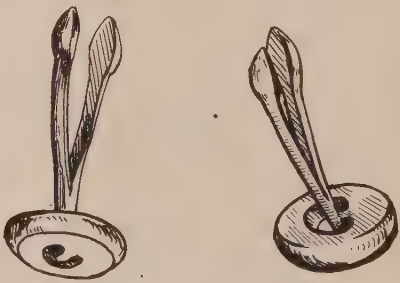


FIG. 129.—Chambers Drain.

The pessaries with external support consist of a cup and stem which are secured to a belt held about the body by rubber tubes or bands. They are employed when the pelvic floor is lost or the vaginal walls so prolapsed that an instrument will not be retained. The cup is apt to induce ulceration of the cervix and vagina from pressure and the stem continually irritates the vulva. The tubes are exceedingly unpleasant and soon become foul from the absorption of secretions.

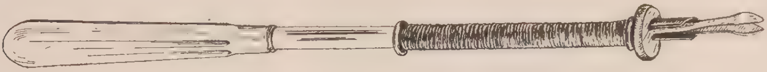


FIG. 129a.—Introducer for Chamber's Drain.

In recent years the pessary has been almost entirely discarded for the more readily executed and effective surgical procedure. Its employment, however, in properly selected cases may render operative procedure unnecessary. This applies to women who have a heavy subinvoluted uterus following a recent abortion or labor, where the maintenance of the organ promotes involution until the ligaments are able to continue the support. The intrauterine stems and drains are often capable of affording relief when all other procedures fail. In the employment of a pessary, there are certain rules which are indispensable for comfort and freedom from bad results;

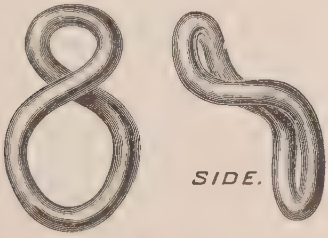


FIG. 130.—Schultze Pessary.

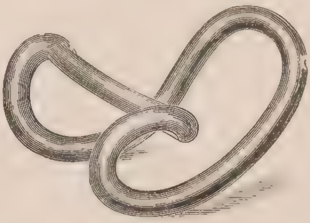


FIG. 131.—Schultze's Sledge Pessary.

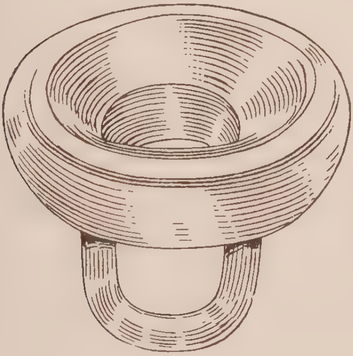


FIG. 132.—Cup Pessary.

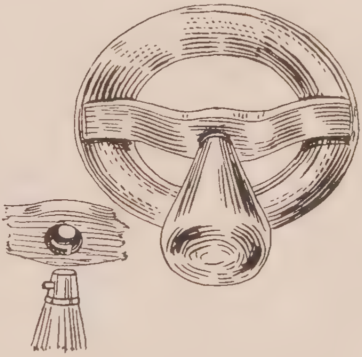


FIG. 133.—Menge Pessary.

1. The uterus must be freely movable, readily replaced, free from surrounding inflammatory exudate, its cervix not lacerated and the vaginal walls capable of affording support to the instrument.

2. The instrument must fit the canal snugly without producing undue pressure. Occasionally the posterior vaginal fornix will be so contracted from a long existing retrodisplacement as to require preliminary stretching with a tampon before a pessary can be worn.

3. The patient, after the insertion of a pessary, must be cautioned to return to her physician or remove the pessary when it occasions pain, and she should not wear it longer than a week after its first insertion without investigation to see that it is causing no injury.

4. The pessary should be removed for cleansing at least every three months. I saw one patient who had worn one instrument twenty-six years without removal. Two-thirds of the pessary was imbedded in hard cicatricial tissue. I cut off the protruding part with bone pliers and pulled the remaining part out of its track.

5. The patient should be enjoined to use daily cleansing douches, avoiding the use of mineral astringents as the salts of the natural secretions and particularly of the mineral astringents will deposit on the surface of the pessary, roughen it and cause extensive ulceration and granulation.

6. Only instruments constructed of hard rubber or celluloid should be employed and these should be especially adapted to the patient. A properly fitting pessary can be worn without the patient's being aware of its presence and it in no way interferes with the marital relation.

113. Electricity in the treatment of pelvic disorders has a value which cannot be denied. Unfortunately, it requires an expert to secure the best results, and it is difficult to combine in one person the reliable diagnostician with the experienced electrician.

Electricity was employed early in an empiric way in gynecology, but its use received a marked impetus when Apostoli formulated plans for more accurate dosage and systematic practice. In addition to its direct effects, electricity appeals to the imagination of the patient and she becomes impressed with its possibilities.

The current may be generated by friction or through chemical action, and requires extensive apparatus for its application. The general installation of electricity for power and lighting permits the use of the street current for the work of the physician. The value of the agent depends upon the manner of application and the character of the current.

114. The static current generated by friction (often called *Franklinism*) exercises a beneficial influence as a nerve stimulant and counterirritant. It is especially advocated in the treatment of hysteria and neurasthenia. The greatest benefit is obtained where the local pelvic lesions are slight and pain is the dominant symptom.

115. The induced, or farradic, current may be used internally, externally, or both combined. It has a slight chemical reaction and is used as a stimulant. The secondary current is effective in the relief of pain in the abdomen and pelvis of neurotic women, and is best applied by the bi-polar uterine electrode. The bi-polar uterine electrode with this current has been of late advocated in the treatment of uterine fibroids, and exerts its beneficial action through promotion of the muscular action of the uterine walls and consequently more rapid expulsion of the growth as a foreign body.

116. **The sinusoidal current** envelops the patient who lies on an insulated couch in an electrical atmosphere. It is secured by passing a current of 450 milliampères, or over, through a large coil of wire beneath the couch, and varying the effect by the number of interruptions to the second. This procedure is said to modify nutrition by the increased imbibition of oxygen and the greater elimination of carbonic acid induced. It exerts a marked analgesic effect which frequently causes the disappearance of painful symptoms. While of benefit in dysmenorrhea, its most marked beneficial results are to be seen in the resorption and disappearance of pelvic exudates in chronic pelvic inflammation.

117. **The continuous** *or galvanic current*, has been used with a marked impetus through the teaching of Apostoli, who demonstrated the methods by which the dosage could be determined and a greater voltage be employed safely. The influence exerted depends on the proximity of the structures to be influenced to the respective poles. Thus, the *positive* pole acts as a sedative to the sensory nerves and as a vasoconstrictor of the vessels in its immediate vicinity. In the higher powers it acts as a cautery.

The *negative* pole, on the contrary, stimulates the collection of the alkaline salts in its vicinity and exerts a greater chemical action on the tissues. Its most beneficial effects in gynecology are seen in the relief of pain in dysmenorrhea and in the treatment of chronic endometritis and pelvic exudates. While its long continued hemolytic action lessens the hemorrhage in submucous and interstitial fibroid growths, this distressing symptom can be speedily and successfully relieved in other ways.

118. **Röntgen** discovered the peculiar influence induced by electric excitement on light when transmitted through tubes of high vacuum. The rays so induced, he named the *X-rays*. They have proven both diagnostic and therapeutic. Their employment has proven of especial value in the treatment of the eruptive diseases of the external genitalia. Accidentally it has been discovered that the abnormal hemorrhages and discharges can be controlled effectually through their use. The use of the X-rays has not only been found to lessen and even arrest the hemorrhage, but also leads to a reduction in the sizes of the growths. This action is doubtless due to the inhibitive influence of the rays on the action of the ovarian secretion. Their continued use results in the establishment of sterility and the climacteric, consequently the action upon the fibroid growth is similar to that which takes place subsequent to the menopause. When the growths are of considerable size, the ovaries may be so covered and protected by them that the rays do not penetrate with sufficient force to effect the necessary alteration to arrest hemorrhage and bring about retrogression of the tumor. In superficial forms of malignant disease, the rays have a restrictive influence in the progress of the disease and in some cases may result in the entire disappearance of the local manifestation. This fact, however, should not lead to the use of the X-rays where the local manifestations are so situated that a hope-

ful operation can be performed. In the manifestation of malignant disease, in the deeper structures, around the uterus or in the area immediately surrounding the field in which hysterectomy has been done, I have been unable to see any beneficial results from the use of the Röntgen rays. The discomfort in attempting to make the rays effective in these deeply seated structures is not compensated by the beneficial results obtained.

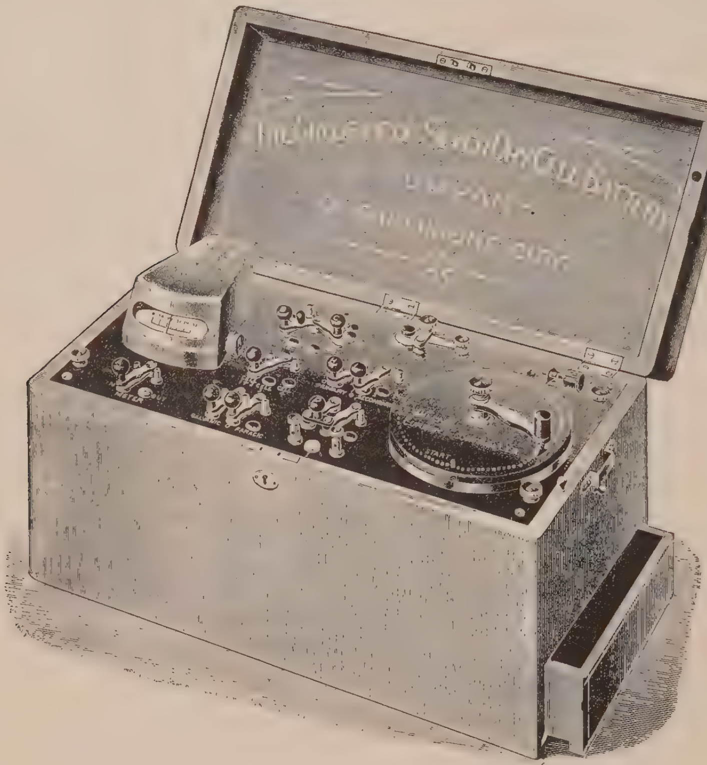


Fig. 134.—Portable Galvanic Battery with Balvanometer.

119. Contraindications. According to Apostoli, the galvanic current is contraindicated in the following conditions: (1) hysteria; (2) intestinal catarrh; (3) pregnancy; (4) malignant degeneration of a tumor; (5) fibrocystic tumors; (6) suppurative inflammation of the adnexa. To these, Schaeffer would add any acute or subacute inflammation of the pelvic viscera, a very hard or fully matured tumor, an excessively large

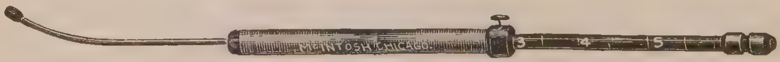


Fig. 135.—Intra-uterine Electrode with Movable Insulating Cover.

growth, a submucous growth which is pedunculated, enfeebled heart action, or acute nephritis.

120. The Finsen light consists of the ultra-violet rays, which are invisible to our vision and are capable of refraction and concentration. They exist largely in sunlight, but may be artificially produced from the arc light. Glass is a nonconductor to these rays, therefore it is necessary to construct a plate or disc of quartz, or, still better, of transparent rock-salt. The Finsen light differs from the Röntgen rays in being very destructive to bacterial life, while the latter, if it has any effect, rather facilitates bacterial growth. The application of the Finsen light must, under present conditions, have a limited application in gynecology, because it causes an anemia of the tissues upon which it is purposed to exert its influence.

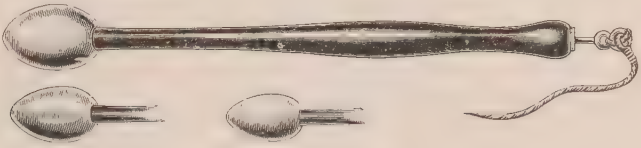


Fig.—136. Vaginal Electrodes of Different Sizes.

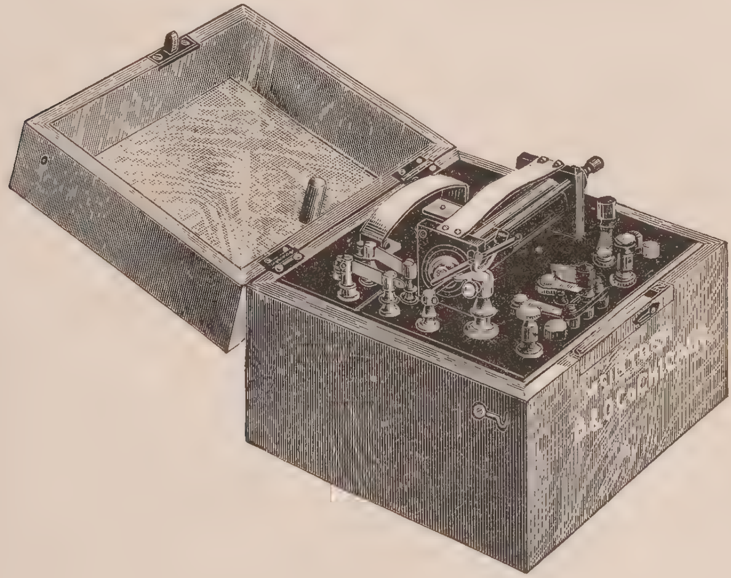


Fig.—137. Faradic Battery.

121. Electrocautery and Light. The employment of electricity as a means of producing heat for cautery has won a well-recognized place through the work of Byrne with the galvanocautery, and later its ingenious application by Skene and Downes to electrothermic hemostasis.

The power can be secured by batteries of large size, by storage cells, or, better, from the street main through a transformer. Dr. Downes has modified and improved the instruments devised by Skene. He applies to the broad ligaments a special form of angiotribe which, when raised to a dull red heat, divides and cooks the tissues, thus rendering ligatures unnecessary.

The great advantage of this procedure is in hysterectomy for cancer of the uterus, as it enables the removal of a large amount of possibly infected tissue. The malignant cells which have been carried into the parametrium are supposedly less resistant to the effects of heat than healthy tissue. Therefore it seems reasonable to infer that some of these are destroyed by the electrothermic measures which would otherwise survive to cause relapse if other methods of operating had been employed.

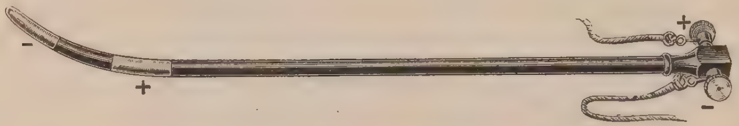


Fig. 138.—Bipolar Uterine Electrode.
+ Positive pole. — Negative pole.

The same class of batteries employed for cautery purposes also may be used for electric light which is especially useful in inspecting the urethra, bladder, ureters and rectum. The electric light in a cystoscope can be introduced through the urethra and the entire cavity of the bladder exposed, the orifices of the ureters recognized, and any changes in the structure of the bladder readily observed. The instrument may be employed to irrigate the bladder by closing its end; the bladder can be distended with air or gas, thus determining the capacity of the organ. Loss of structure, thickening, growths, and other changes in its walls are also perceived. It also can be employed for local medication and for catheterization of the ureters. The electric light can be employed to illuminate the rectum through long or short proctoscopes; the vagina by an attachment to a speculum; and even to look into the uterus, but as the latter canal has to be previously dilated, the instances are rare when its illumination will be of practical service.

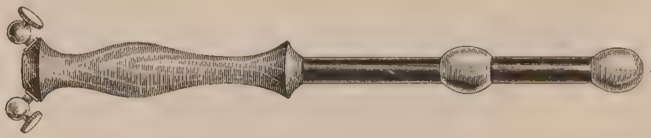


Fig. 139.—Vaginal Electrode—Bipolar.

122. Radium. The recent investigation of Tuffier and others on the action of radium have demonstrated its beneficial influence in carcinoma uteri, myomata and metritis. In cancer, its effect has been to render operable cases which previously were regarded as belonging to the inoperable class and as arresting the progress of development when the disease had recurred subsequent to hysterectomy. Should subsequent investigations confirm the experiences so far secured, it will become advisable to employ this agent as a prophylactic against recurrence after every radical operation.

The radium salt of high potency confined in glass tubes or discs covered with caoutchouc web or a thin screen of lead foil or aluminum is placed in the vagina and protected by a gauze or cotton tampon. The application is permitted to remain twelve to sixteen hours—occasionally twenty-four hours. A daily application is made for a series of five or six days, after which ten days' interval is allowed to transpire before the next series.

In fibroids and metritis, a stem for insertion into the uterus is also employed. The treatment, it is claimed, results quickly in an arrest of hemorrhage, cessation of discharge and amelioration of all unpleasant phenomena.

123. Infection. The discussion of the action of the micro-organisms (see diagnosis) has prepared the student to appreciate the importance of combating infection in its various manifestations. Frequently deaths following operations are attributed to heart failure, shock, pyelonephrosis, and pneumonia when, without question, these lesions have been the result of infection. Infection reaches a wound more frequently from unclean hands or instruments than through the atmosphere.

Terms: The study of the phenomena of infection has originated the terms sepsis, antisepsis, and asepsis. *Sepsis* indicates the existence or sequela of infection; *antisepsis*, the employment of agents which are either destructive to bacteria or restrain their baneful influence; *asepsis* comprises the exercise of measures to exclude from the field of operation all pathogenic germs and their products. The latter is the ideal procedure, but when we come to deal with agents so intangible that a microscope is required to reveal their presence, and so occupying the atmosphere as to render it absolutely impossible to preserve aseptic or sterile everything that may come into contact with the affected tissues, a combination of the two methods seems a wiser plan of procedure.

Sterilization means the entire destruction or removal of germs. Complete sterilization of everything is an ideal asepsis.

124. Methods of Sterilization. The most effective method of sterilization is to use the flame, but its action is necessarily limited because of its destructive influence on the temper of instruments. It is employed to destroy worthless and dangerous objects such as soiled dressings. Either dry or moist heat may be employed. The vegetative bacteria are destroyed by comparatively low temperatures, from 106° F. to 150° F. The spore-bearing bacilli require a higher temperature and stronger chemical solutions.

Sterilization by dry heat is infrequently employed, for the reason that a temperature of 284° F. for three hours is required to insure the destruction of the spore-producing micro-organisms (Robb). It is rendered unavailable, not only by the time required, but also because it is injurious to instruments and destructive to ligatures and dressings.

An effective and easy method of sterilization is by the use of steam, which requires an apparatus from which the air can be expelled and the temperature maintained evenly at 212° F. A convenient and cheap apparatus for this purpose is an Arnold copper sterilizer. (Fig. 140.) The most effective sterilization is accomplished in a sterilizer which employs superheated steam under pressure. Steam at a temperature of 220° to 230° F. at a pressure of 15° insures the sterilization of large packages, but to prevent reinfection the sterilized packages should be thoroughly dry before removal from the sterilizer. The sterilizing apparatus is usually so constructed that steam can be turned out of the central chamber into the surrounding jacket and thus insure the drying of the contents of the chamber. Ligatures and sutures may also be sterilized in the same way, but more effectively by boiling. Silk will not stand long or repeated boiling without becoming friable. The towels, sheets, and operating gowns should be subjected to what is called the fractional method. This consists in placing the material in the sterilizer for one hour the first, and one-half hour each succeeding day for two days. When dry and protected properly, they will remain aseptic for an indefinite time.

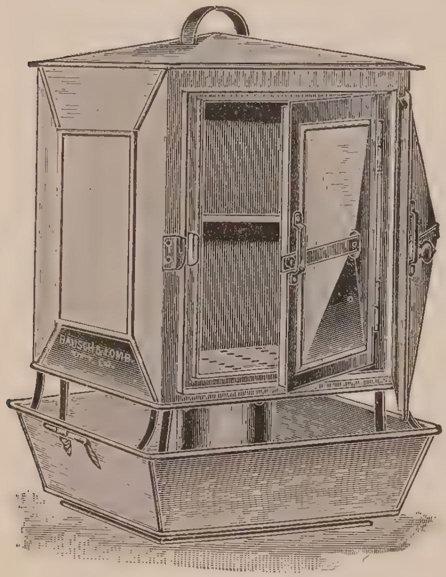


Fig. 140.—Arnold Steam Sterilizer.

125. The instruments for examination and operation should be capable of being cleaned thoroughly. They should be cleansed after every operation and boiled before the next. They should be placed in trays dry, or upon a sterile table. It was formerly the custom to place instruments in a 5 per cent. solution of carbolic acid. If the instruments are cleansed properly, the use of this agent is unnecessary, and in many operative procedures, particularly those upon the peritoneal cavity, it is objectionable, as it causes irritation of the delicate structure of the peritoneum. The instruments should be sterilized before beginning an operation. Davidson says five minutes' boiling in water destroys all germs, but if the instruments have been used in pus or about gangrenous cases it is important that we should exercise still further precautions to render them absolutely sterile. They may be boiled for ten minutes in a 5 per cent. solution of carbolic acid. The water should be boiling before the instruments are placed within it or they will rust. Rusting can be prevented by using a 1 per cent. solution of carbonate of soda. This method of procedure affords a ready means of sterilizing an instrument which has been dropped during an operation. It has the advantage that any vessel can be used. The instrument trays—preferably of glass or porcelain, as being most readily disinfected—should be sterilized by heat, or, after careful washing with soap and hot water, should be filled to the brim with 1:500 solution of bichlorid. Trays should be emptied and washed out with plain sterilized water before the instruments are placed in them.

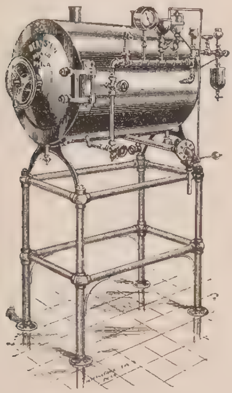


FIG. 141.—Steam-pressure Sterilizer.

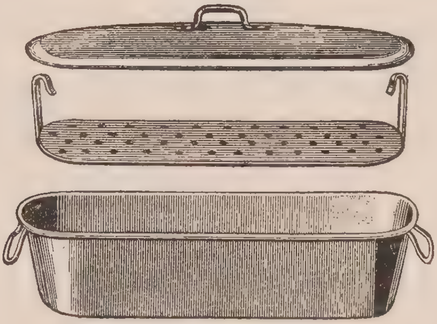


FIG. 142.—Sterilizer for Boiling Instruments.

126. Sponges. The ordinary sea sponge is rarely used. Dry gauze pads are used almost exclusively for walling off the intestines and mopping the operating field. They are made by taking a yard of gauze and folding it so that all raw or selvage edges shall be turned in and the possibility of leaving portions of the fibre in the wound or cavity avoided. It is well to have several longer folds of gauze for packing or walling off the cavity. They are done up in packages and must be sterilized by the fractional method and kept free subsequently from any infection. The person who dispenses them at the operation should handle them only with sterilized metal instruments.

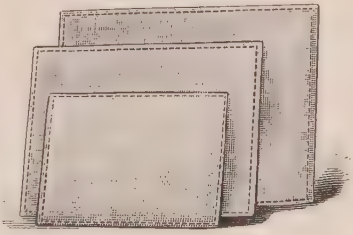


FIG. 143.—Gauze Pads.

The greatest care must be exercised to make certain that all pieces of gauze are accounted for before closing the abdominal cavity. It is advisable to assign two persons to the sponges. One gives them out, and as she does so counts them. The second person accumulates and counts the sponges after removal from the wound. The tally of sponges issued and received should agree before the wound is closed and the operator should satisfy himself by very careful examination that none are retained. An aseptic sponge may be retained without delaying the healing of the wound and become encysted, but later may form an abscess and open externally into the vagina, bladder, or rectum. Occasionally a large vessel may be eroded and a fatal internal hemorrhage occur. When the operator has to depend upon uncertain assistants, it is better to return to smaller pieces of gauze, which can be washed and used over and over during the operation.

127. Ligature and Suture Material. Silk, twisted or plaited; linen; silver or iron wire; tendon; silkwormgut; catgut; and horsehair are some of the materials employed for ligatures and sutures.

Silk has the advantage that it can be prepared quickly or sterilized by boiling. It is still used by many surgeons both as suture and ligature. To overcome the objection that the fluids enter its substance and that it acts as a seton or drain, it is wrapped on glass slides, boiled for thirty minutes, washed in alcohol, dried and then soaked for forty-eight hours in a solution of gutta percha in turpentine (1:10), boiled for an hour in normal salt solution and stored in a solution of chinisol (1:500) or an alcoholic solution of periodid of mercury (1:800). (Webster.)

Linen thread should be impregnated with celloidin. It is prepared as follows: 1. To rid the thread of its grease, it is boiled in a soda solution and washed in cold water. 2. It is boiled in sterile water for six minutes and placed for six hours in absolute alcohol, when this process is again repeated. 3. It is dried in a warm chamber and rolled on glass spools. 4. The spools thus wrapped are placed for thirty-four hours in a 30 per cent. solution of celloidin in equal parts of alcohol and ether, to which 1 per cent. of sterilized castor oil has been added. 5. The sutures are rolled on a wooden frame to dry and the excess of celloidin is removed with sterilized paper. They are kept in a closed glass jar and are twice boiled in a 1:1000 solution of corrosive sublimate before using (Webster). The possibility of infection of silk or linen when used upon the stump of a suppurating tube, or in a pelvic cavity when suppuration is present, or the long-continued sinus that results until the ligature itself has discharged, has led me to prefer some material for ligation that is more certain to be absorbed and will not remain in the tissues so long. I have had occasion to open a sinus and remove a large ligature from a patient upon whom the operation had been done four years before, while the abscess did not form for three and one-half years. Consequently, for some time I have used nothing but catgut for ligatures and internal sutures. This material, when carefully prepared, is perfectly safe, and we have no reason to feel that the patient will experience inconvenience after convalescence occurs. Patients in whom no suppuration has occurred, nor sinus resulted, have subsequently suffered from pressure upon the nerve-fibers by an encysted ligature, requiring reoperation a year or more later for removal of the ligature in order to secure relief. *Catgut for ligature* is prepared as follows: No. 00, No. 0, and No. 2 catgut, as obtained from the shops in long pieces, is placed in ether or benzin for a number of days, or even weeks, to extract the fat. It is removed from this and tightly wrapped upon wooden blocks or glass tumblers, and placed for thirty hours in a solution of dichromate of potash:

℞.	Potassii dichromat		1.5
	Acid. carbolic, Glycerin,	āā	10.0
	Aqua,		480.0

The dichromate is dissolved in the water, and the carbolic acid and glycerin are added.

Fixing of the gut before its immersion in the solution is very important, as it otherwise becomes hopelessly twisted and entangled. After removal from the solution the strands should be wrapped upon prepared boards about a meter long, and while so wrapped they should be dried carefully. From these boards it is cut in meter lengths, and the pieces are wrapped tightly upon glass drainage-tubes. Each tube contains two pieces of gut. These tubes are placed in a 1:1000 solution of sublimate in water for eight hours. This solution is poured off and replaced by a 1:500 solution of sublimate in alcohol (90 per cent.), in which the catgut remains for twenty-four hours. From this solution the tubes are lifted by sterile forceps into absolute alcohol, to each half pint of which one dram of sterile glycerin has been added. The tubes are removed from this solution for use. Any catgut unused after an operation is not replaced.

No. 2 gut is employed for ligatures, No. 00 and No. 0 for sutures. Gut so prepared is, in my experience, an unirritating and satisfactory material for ligatures and sutures.

When it is not desired to harden the catgut, or there is no need of its remaining in the tissues for a length of time, the solution of dichromate of potash may be omitted. Catgut prepared by immersion in solutions of *iodin*, *formalin*, or the *silver salts* is claimed by its advocates to resist infection within the tissues of the body.

Dry Iodin Catgut. The commercial catgut cut to suitable lengths is wrapped in single layers on glass tubes and each end of the piece secured. It is immersed eight days in a solution containing one part each of iodin and potassium iodid to 100 parts of water. The solution is then poured off, the vessel covered with several thicknesses of gauze and dried. The catgut is kept in well closed jars or bottles to prevent volatilization of the iodin and used dry. (Moschowitz. Annals of Surgery, Vol. xlii, 1905, p. 321.)

Formalin Catgut. Take dry catgut 10 feet long wound around a glass drainage tube, submerge in a 3 per cent. formalin solution in which it remains from one to four hours; place in running water an equal length of time and dry in the open air. It becomes mercerized by the process and should be kept dry. (Congdon. American Journal of Obstetrics, Vol. li, 1905, p. 47.)

Silverized Catgut. Commercial catgut wound on glass reels is submerged in a 1 per cent. solution of silver lactate (actol) in which it is allowed to remain for eight days, during which time the glass jar is wrapped in cardboard to keep out the light. The liquid is then poured off. The jar covered with four thicknesses of gauze is exposed to the light until the strands turn black, when it is washed in water until the latter remains clear. The jar is again covered with four thicknesses of gauze and kept in a warm place until the catgut is thoroughly dry. When used the catgut is placed in 60 per cent. alcohol. (MacClure. Annals of Surgery, Vol. xlviii, 1908, p. 769.)

It is claimed for all of these preparations of catgut that the sutures and ligatures have an inhibitory influence on septic processes even when placed in pathogenic material. Chromic catgut may be submitted to one of these processes subsequently, the better to insure its being inocuous.

Horse hair sutures are used principally to approximate the skin edges, but it is less advantageous than the plain catgut which does not have to be removed. A number of manufacturers now put up catgut in alcohol or chloroform sealed in glass tubes, in which it is kept free from contamination until desired for use. It is thus prepared plain or chromicized. By some it is marked 10-, 20-, or 40-day catgut, but experience has taught me not to place reliance on such promises. In the acid secretion of the vagina, none of it is certain to last more than ten days or two weeks.

Silkworm gut forms an excellent suture, is clean, not readily infected, and easily taken care of. It may be boiled ten minutes prior to the operation.

The nurse or attendant in handling the sutures should wear rubber gloves. Catgut never should be drawn through the bare hands. The tubes containing the sutures and ligatures should be immersed for a few minutes in a 1:1000 solution of corrosive sublimate, or, still better, boiled for two minutes before they are broken.

128. **Dressings** of gauze medicated with various germicidal or inhibitory agents have been advocated, but they present no advantage over sterilized gauze. The latter is nonirritating and serves every purpose. It should be sterilized by steam, the fractional method being employed. The sterilization should continue one hour the first day, the second day half an hour, and the third day the same length of time. When dried the gauze should be wrapped carefully until it is used.

129. **Personal cleanliness** of the operator and assistants should be a matter of conscience. A person with nasal catarrh or bad breath from decayed teeth or foul stomach is disqualified to be either an operator or assistant. This is particularly true in peritoneal operations. Even the slightest examination should not be undertaken unless the hands and nails are carefully cleansed, in order to insure against the introduction of infectious material, and in every operative procedure the hands and arms should be scrubbed with soap and hot water, giving thorough attention to the condition of the nails. The longer the hands are scrubbed with soap and water, the less active are the germs that inhabit the surface beneath the finger-nails. After thorough washing with soap and hot water, the nails should be scraped and the washing again repeated. The fingers, especially about the nails, should be scrubbed with a piece of sterile gauze wet with a 1:500 solution of bichlorid in 70 per cent. of alcohol, and subsequently washed in sterile water. Probably still better is a solution suggested by Charles Harrington, of Boston, which consists

of commercial alcohol (94 per cent.), 640 c.c.; hydrochloric acid, 60 c.c.; water, 300 c.c.; corrosive sublimate, 0.8 gram, in which the hands and arms should be bathed for thirty seconds to a minute after having been washed thoroughly with sterile soap and hot water. I have used this solution for several years with gratifying results. Nurses and assistants who are to take part in the operation and handle sponges or dressings should be required to exercise the same precautions rigidly, and should be taught the importance of carefully avoiding contact with any nondisinfected article. If they should accidentally touch a door, basin, clothing, the face, or any nonsterile object, they should again scrupulously cleanse their hands before coming in contact with dressings or instruments. Chemical disinfection of the hands after scrubbing with soap and hot water by immersion in a solution of permanganate of potash (4:1000), then in a concentrated solution of oxalic until this stain is removed, then in lime water and finally in sterile water, has been advocated. Another method is to wash them with equal parts of sodium carbonate and calcium chlorid to which water is added gradually. The chlorin set free is the effective agent. There are but few persons, however, whose hands will endure the use of either of these methods of cleansing several times daily.

Before examining a case of cancer, where there is considerable decomposing material, it is well to anoint the fingers with turpentine and afterwards with vaselin as thus the disagreeable odor is removed more readily from the fingers. Rubber gloves, or a common condom drawn over two fingers before examining cancer or other infectious cases is preferable. The impossibility of securing absolute sterility of the hands and the varying susceptibility of different individuals to the influence of infectious germs makes the habitual wearing of rubber gloves a prudent policy. Certainly surgeons engaged in general surgical practice do wisely to wear rubber gloves when operating within the peritoneal cavity. Gloves must be worn when the operator has recently examined or operated upon patients who were suffering from some infectious disease.

During the operation, the operator should have conveniently situated two vessels, one containing a solution of 1:1000 acid sublimate, and the second sterile water, into which he can occasionally dip his hands. In operations within the abdomen it is better that the bichlorid should be replaced by sterile water. He should wear clean linen and should have his clothing entirely covered by a sterilized apron. When there is much fluid, as in plastic operations on the vagina, in which continued irrigation is practised, the clothing should be covered with some waterproof material beneath the apron. Where conditions will permit, it is better that the surgeon should make a complete change of attire, both in the interests of his own health and for the safety of his patient.

130. The room and environment of the patient should receive careful consideration. The room should be well lighted, ventilated and thoroughly cleaned, free from matting, hangings, and everything that is likely to retain dust. In fact, no more furniture should remain in the room than is absolutely necessary. The operating room should be one whose walls can be washed thoroughly and cleansed carefully. Its furniture should be made of metal and glass. When the operation is to be performed in a dwelling, the room should be scrubbed carefully with a carbolic-acid solution (50:1000) two days in advance. In a private house where the rooms are old, or their condition at all suspicious, they should be disinfected with formaldehyd apparatus. It was formerly the practice to operate under the carbolic acid spray, but it was found to have a prejudicial influence upon the peritoneum. Until quite recently some operators still kept a spray in the room for the moisture and to secure the beneficial influence of the carbolic acid, but the drug is so disagreeable and injurious to many patients that the practice has been discontinued. Sterilized water should be at hand in carefully covered vessels, and when antiseptic solutions are used, they should be so designated that no mistake can be made.

131. **In the preparation of the patient** the action of the skin should be promoted and cleanliness secured, where the condition of the patient will permit, by a full bath. The diet must be regulated according to the character of the operation. In peritoneal and intestinal operations, milk and other foods containing much waste should be excluded.

A thorough evacuation of the bowels should be secured by the administration of half an ounce of Rochelle or Epsom salts; two drams of compound licorice powder; half a bottle of magnesium citrate or an ounce of castor oil, two nights previous to the day set for the operation. A large rectal enema of soapsuds should be given the preceding night. The patient should be kept in bed for twenty-four hours prior to a serious operation.

Special attention should be given to washing the external genitals, the anus and the depression of the umbilicus. Vaginal irrigation with 1:2000 sublimate solution should accompany each bath and may be given without it. The abdomen and genitalia should be shaved the evening before operation and the abdomen washed with tincture of green soap and hot water, the flesh brush being diligently applied. If the patient is uncleanly, or the skin is oily, the surface should be washed with ether, then with soap and water, and finally with 60 per cent. alcohol. This washing should be repeated on the morning of the operation, and the abdomen covered with a pad saturated with sublimate solution, retained by a bandage, to be removed when upon the operating-table. In all cases it is desirable that the field of operation should be again thoroughly scrubbed after the administration of an anesthetic, with soap and hot water, the superfluous soap being removed with alcohol.

Special preparation for vaginal operation should consist in a careful cleansing of the vagina. For this purpose a combination of creolin with green soap is very effectual, using creolin, one or two drams, and green soap, one or two ounces, to the quart of hot water. The vaginal canal should be scrubbed thoroughly with this solution, introducing two fingers wrapped with gauze. This procedure will remove all débris which may have lodged in the crypts and folds of the vagina. The solution should be removed by washing with sterilized water, then with alcohol. Creolin is not so effective an agent in sterilizing the vagina as the acid sublimate solution, but it has the advantage of leaving the vagina soft and flexible, which is an important consideration in *obstetrics* as well as in all operative procedures upon the vagina. The bichlorid and carbolic-acid solutions, on the other hand, have a constringing effect upon the vagina, which renders it less elastic.

132. **Irrigating tubes** and cannulæ used for the purpose of cleansing the vagina should be made of glass (Fig. 144), as they are more readily cleansed, less likely to contain infectious material, and are sufficiently cheap to permit them to be thrown away when used in suspicious cases. If injections are used by the patient, there should be no central opening of the nozzle, for it may be introduced directly into a patulous cervical canal, and fluid thrown with force into the cavity results in severe uterine colic. Indeed, fluids have been thrown into the uterus and forced by uterine contraction through the tubes, which caused serious, if not fatal, pelvic inflammation. There is no special advantage in having a curved cannula or tube for irrigation. The nozzle used by the physician in an operation should have but a single orifice, and that a central one. After irrigation has been practised, pressure should be made upon the fourchet, to insure the entire escape of fluid. It it sometimes advised that the irrigation should follow the examination or operation, but we cannot impress too strongly upon the student the fact that the genital canal sometimes contains dangerous germs, and that antisepsis must precede as well as follow an operation. In cancer or sloughing fibroids in addition to the ordinary disinfection we may require the use of deodorizing agents. For this purpose may be used a 3 to 5 per cent. solution of thymol, or two or three tablespoonfuls of Labarraque's solution to the quart of water.

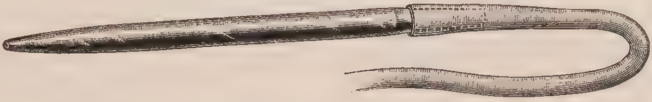


FIG. 144.—Irrigating Glass Tube. Open End.

133. **Gauze.** After the uterus and vagina are cleansed carefully the canal may be packed with iodoform or other antiseptic gauze which will remain sweet for a number of days. Iodoform gauze is preferable. To prepare it, ten layers of plain gauze are sterilized by boiling, preferably in a solution of carbonate of potash, washed, then soaked in a solution consisting of iodoform 50, glycerin 100, and ether 700 parts, after which the gauze is passed through a wringer and dried in a darkened, isolated room at a temperature of 85° F. When dry, it is placed in tin boxes. This gauze should always be sterilized before use. This can be accomplished best by heating it to the temperature of 250 F., by which both germs and their spores are destroyed. It should be remembered that iodoform is not a germicide. Its value is in its reductive influence upon the ptomains and leukomains, by which their deleterious effects are arrested. Iodoform is poisonous to some patients in whom it produces

high temperature, irritation of the skin, and a smoky, darkened urine, and in others extreme disturbance of the digestive tract. In such idiosyncrasies one of the other forms of antiseptic gauze should be preferred. These comprise borated, salicylated, carbolized, formalized, and acetanilid gauze. Sublimated gauze can be made by boiling it first in a solution of carbonate of potash (20:1000), then an hour in a (1:1000) sublimate solution, when it is dried in a sterilizing oven and preserved in closed glass jars. Salol and iodol are inferior in their action to iodoform. Carbolic acid is unreliable. Aristol, a powder made by the combination of thymol and iodin, is probably preferable to iodoform. It has the advantage of the absence of disagreeable odor, is very dry, not rapidly soluble, and coats over and protects the surface.

134. **Antisepsis of the cervix and uterine cavity** is secured by intrauterine injections of sublimate solution, carbolic acid, dioxid of hydrogen, or, preferably, formalin (1:1000). Of the solutions of mercury, the acid sublimate is better for the reason that it does not form an albuminate of mercury by combination with the serum of the blood, and is less likely to be absorbed and to produce a toxic effect. This agent is not as dangerous as in obstetrics, unless there has been a large denuded surface. In such cases its use should be followed by an injection of sterilized water. I prefer a hot 1 to 2 per cent. solution of sodium chlorid or a 2 per cent. solution of the sodium bicarbonate for irrigation of the uterine cavity during or following a curetment. It is fully as efficient as the stronger germicidal agents, and if a perforation should occur, or fluid pass through the tubes, this fluid will prove innocuous in the peritoneal cavity.

In order that the return flow may not be obstructed in intrauterine injections a double catheter should be used. It may be made of hard rubber, glass, celluloid or metal; the last named is more likely to be acted upon by the mercury salts. If the uterine cavity is well dilated, the double tube will not be necessary. After the uterine cavity is carefully cleansed, it may be packed with iodoform gauze or a pencil of iodoform may be introduced. Von Hacker recommends the following: Iodoform, 5 drams; gum acacia, glycerin, starch, each 30 grains; mix, make pencils, introduce into the cavity of the uterus. When these pencils give rise to uterine colic, it may be preferable to dust the cavity with iodoform through an insufflator, or, still better, to use aristol by the same means.

In sloughing fibroids or intrauterine cancer, the uterus should be irrigated with an acid sublimate solution (1:2000), followed either by sterilized water or a solution of chlorid of sodium (6:1000). The offensive odor probably will be controlled more effectually by irrigation with permanganate of potassium (4 per cent.) or a 2 per cent. solution of thymol. In operations upon the vagina or cervix continuous irrigation may be practised, using for this purpose a solution of carbolic acid (5:1000), sublimate (1:2000), formalin (1:1000), or, better, chlorid or sodium (6:1000). The irrigation washes away the blood, renders unnecessary the use of sponges, and the surfaces are constantly kept bathed with the antiseptic fluid. It is the preferable procedure in all operations upon the vulva, vagina; and cervix.

135. The Use of Tents. In dilating the uterus the sponge, tupelo, or laminaria tents, although carefully disinfected, are not without danger. Pozzi recommends the latter tent, but he first immerses it in a saturated solution of carbolic acid and rectified spirits, or in a solution of iodoform and ether with a tenth part alcohol. In my judgment the best method of rendering the tent safe is to immerse a laminaria (or series of such tents) in the official tincture of iodin for a few minutes prior to its introduction into the uterine cavity. The objection to the use of tents is the difficulty in sterilizing the uterine canal previously. Unless it is thoroughly done, as in the performance of any operation, the patient is in danger of subsequent inflammatory attacks. For this reason except when a digital exploration of the uterine cavity is required, I prefer to accomplish rapid dilatation by bougies in preference to the slower method with the tent.

136. Abdominal Section. The peritoneum is a membrane exceedingly susceptible to the influence of all chemic agents, and its delicate structure would be injured or destroyed by any agent of sufficient strength to have a germicidal influence; consequently, our aim should be rather to procure asepsis than antisepsis. Assistants must be personally clean. They should take a thorough bath and see no case of contagious disease prior to the operation. They should remove their coats and vests, bare their arms to above the elbows, thoroughly scrub their hands and arms with soap and hot water, and wash in disinfectant solutions. Their clothing should be covered with clean sterile linen. They should subsequently avoid shaking hands or touching any objects not disinfected. The greatest immunity to infection will be secured by the operator and his assistants wearing rubber gloves.

137. General anesthesia is necessary in the performance of the majority of operations and is of great advantage in all. In the virgin, in nervous patients, or those in whom the abdominal and pelvic organs are very tender from the presence of inflammation, the administration of an anesthetic renders an examination much more satisfactory to the physician and less distressing to the patient. For an examination, the patient should not be long under the influence of an anesthetic nor should she have a large quantity administered. Ether and chloroform are objectionable, 1. because of the length of time required to secure insensibility and recover consciousness; 2. the subsequent nausea and vomiting, which frequently last for hours. *Nitrous oxid gas* is an agent which produces prompt unconsciousness, and from which the patient as promptly recovers, but it requires a special, quite expensive, and rather unwieldy apparatus.

Bromid of ethyl is almost as rapid in its effects as the nitrous oxid, requires but a small quantity, the patient regains consciousness almost immediately after the inhalation is discontinued, and its use is much less frequently followed by nausea and vomiting. It can be administered in one's office, and the patient, shortly after return to her home, feels but little the worse for her experience. This agent is very satisfactory for short operations, such as opening abscesses, or dilatation of the urethra or anus. In very nervous patients it may precede the administration of ether or chloroform, whereby the stage of excitement and struggling is avoided. Its principal disadvantage is a pronounced garlicky odor to the breath which continues for several days after its administration.

With Dr. P. B. Bland, during 1902–1903, I made some experiments with chlorid of ethyl and was much pleased with its action in producing quick anesthesia. I employed it for anesthesia in a number of serious operations In one patient I did a hysterectomy under its use, the time for anesthesia being fifty minutes, without any unpleasant symptoms. With a suitable inhaler it was effectually employed with the administration of a very small amount of the agent. It did not seem to produce any uncomfortable sensations following the operation, although the anesthesia was not so profound and durable as that induced by other anesthetics. The death of a patient under its administration for the insertion of laminaria tents led me to discontinue its use. For prolonged operations ether and chloroform are to be preferred. *Ether* is generally recognized as the safer drug. In the very young or the aged it is less satisfactory than chloroform, and probably not so safe. *Chloroform* should be preferred in the presence of renal disturbance and when the patient is suffering from emphysema or chronic bronchitis. Some of the French surgeons advocate the administration of 1/6 of a gr. of sulphate of morphin and 1/100 of a gr. of sulphate of atropin hypodermically about twenty minutes prior to the administration of chloroform, and they claim: (1) that it increases the safety by diminishing the danger of syncope; (2) that the patient is much less likely to suffer from nausea and vomiting; (3) that the patient, having taken a smaller amount of the vapor, recovers consciousness more quickly.

Scopolamin-morphin narcosis was advocated by Schneiderlin in 1900 as a means of rendering patients sufficiently insensible to pain to permit the performance of the various surgical procedures. For a time it was used extensively. Korff, who administered the combination in two hundred cases, advised scopolamin hydrobromate 1/10 milligram, with morphin sulphate 25 milligrams, divided into three doses to be given hypodermically, three hours, one and a half hours and half an hour before the operation. The first dose rendered the patient drowsy, the. second put her to sleep and the final one rendered her insensible to pain. Scopolamin-morphin narcosis was advocated as lessening the danger of anesthesia. The employment of such a combination of drugs, though capable of rendering the patient unconscious for hours, cannot be considered as free from danger. The results seem to show that the procedure should be avoided in persons with weak vessels and enfeebled heart action.

It was claimed that the preliminary administration of 1/100 grain of scopolamin hydrobromate with 1/6 grain of morphin enabled the administrator to give less of the ordinary anesthetic and diminished the the postoperative nausea and vomiting. The experience of nearly one hundred cases at Jefferson Hospital clinic has demonstrated that more patients suffer from nausea and vomiting after this procedure than when ether is given alone. The only advantage which I would concede is that where the patient is nervous and fearful of the operation she is so drugged before she comes to the operating room that she is oblivious to everything and takes the anesthetic more easily. The same objection applies to the morphin-hyoscin-cactin combination. The administration of a mixture of chloroform and oxygen obtained by passing oxygen through a bottle of chloroform to the inhaler, decreases the danger of this agent and accomplishes anesthesia with the minimum quantity of the drug, without discomfort, with lessened nausea, and with slight subsequent distress. (Fig. 145 and 146.) The patient does not have the blanched

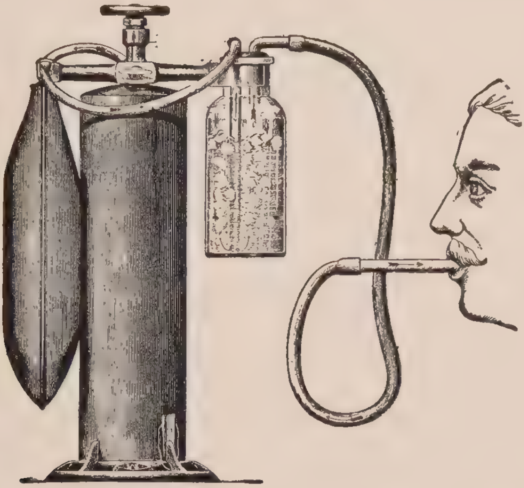


FIG. 145.—White's Oxygen Apparatus, which can be Utilized for Anesthesia by Placing Anesthetic in the Bottle.

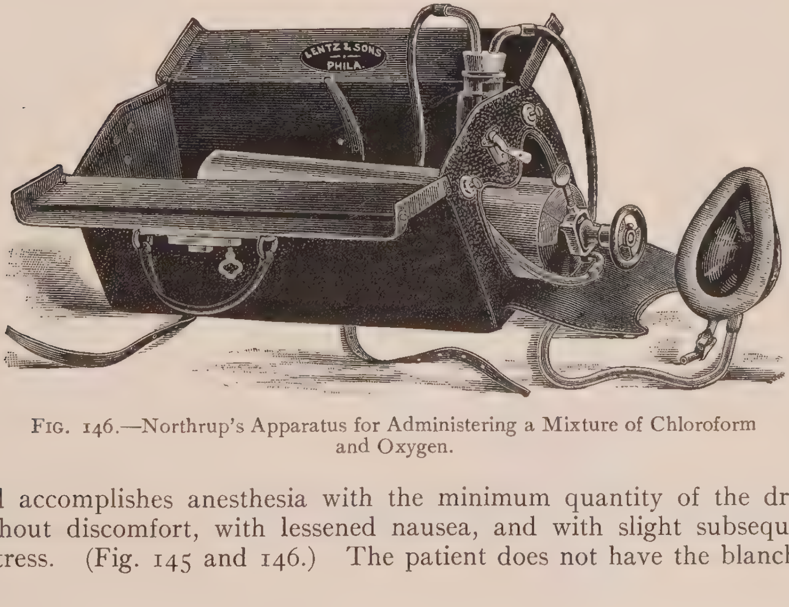


FIG. 146.—Northrup's Apparatus for Administering a Mixture of Chloroform and Oxygen.

appearance of the face, and rapidly recovers when its administration is suspended.

For administration, the patient should be placed in a comfortable position, the head low, the clothing loosened about the waist and neck. False teeth and foreign bodies are removed from the mouth. She should be reassured by the physician both in speech and manner, and be directed to breathe deeply. Talking on the part of the administrator or attendants should be avoided. The pulse, respiration, and condition of the pupil should be observed continually. Dilatation of pupils, blanching of the face, arrested or stertorous breathing, and sudden feebleness of the pulse indicate the temporary withdrawal of the vapor. Continued syncope, particularly in chloroform narcosis, requires resort to artificial respiration —often suspension of the patient head downward. The administrator of the anesthetic should be provided with a hypodermic syringe, solutions of strychnin and atropin, and some nitrite of amyl. The latter agent is of advantage because of its rapid action as a primary heart stimulant, and its influence in dilating the arterioles by action upon the vasomotor system. When chloroform is given largely, a mask and bellows, by which the lungs can be inflated with air, not infrequently will be effective in saving life. In suspended respiration forcible pulling upon the tongue acts as a respiratory stimulant. The inhalation of vinegar following anesthesia appears to lessen the tendency to nausea.

138. Local Anesthesia. General anesthesia is attended with danger in renal disease, in marked pulmonary changes, in fatty degeneration of the heart, and in atheroma of the large vessels. In cases, when general anesthesia is objectionable, local anesthesia may be employed. Freezing by ice and salt, by ether, or by ethyl chlorid spray may be utilized, but its application is limited. Continuous irrigation with carbolic acid has a benumbing effect upon the mucous surfaces, by which pain is obtunded.

The most effective agent for local anesthesia is one of the *cocain salts*. In operations about the genitals or anus it is given hypodermically preferably, and for this purpose the phenate of cocain is the most satisfactory. It is slower in being absorbed, and less likely to be a source of infection from the presence of micro-organisms. Some have advocated *eucain* in preference to cocain, as it is less volatile and hence more readily sterilized. It is also less likely to cause depression. *Stovain*, a synthetic preparation, is claimed to be free from the depressing and toxic effects incident to cocain. Injections should be made with a 1 or 2 per cent. solution, using as much as from one to three grains of the drug. The injection produces anesthesia for the distance of half an inch from the point of the needle; consequently a number of injections may be required. This method of anesthesia has been effective in amputation of the cervix, trachelorrhaphy, and operations upon hemorrhoids and fistula in ano. The drug sometimes has an alarmingly depressing effect. This symptom, it is said, may be avoided by combining nitroglycerin in the injection. When symptoms of depression occur, resort should be had to strychnin, atropin, alcoholic preparations, and nitroglycerin.

Schleich, of Germany, after considerable experimentation, has suggested three solutions for *infiltration anesthesia*. The basis of all is a solution of two parts sodium chlorid, one-fourth part morphin hydrochlorate, in water one thousand parts, to which, for what is called the stronger solution, two parts cocain hydrochlorate are added—one part for the medium and one-tenth part for the weaker solution. The water and salt are sterilized by heat. A larger syringe than usual is used. The site for operation is cleansed carefully; then, after numbing the surface with an ethyl chlorid spray, a puncture is made and fluid injected until a wheal the size of a dime is raised; the needle is introduced in its margin, and so continued until the entire length of the proposed wound is completed. The same effect can be secured by using a long needle and moving it along just beneath the skin, for the required distance, as the injection is given. This procedure secures anesthesia with a single insertion of the needle. The first puncture is the only painful one. The insensibility of the skin lasts from fifteen to twenty minutes.

139. **Spinal anesthesia** is secured by the injection of one to two grams of a sterilized (2 per cent.) solution of cocain into the spinal cavity. The injection is made between the lumbar vertebræ and on a line level with the crests of the ilia. A long needle is introduced. Its entrance into the spinal canal is indicated by the escape of spinal fluid. This form of anesthesia has been largely practised by Tuffier, of Paris, who observed no untoward symptoms and found it very satisfactory in all operations below the diaphragm.

In a patient who had one kidney removed and the remaining one so diseased as to render the employment of a general anesthetic unwise, I used this method to open a sinus which extended down to the vertebræ and into the pelvis without pain to the patient, nor the depression and horrible nausea which had been associated with her previous operations. A second patient, a young girl, had a large necrotic ovarian cyst, a portion of one lung consolidated, and a mitral murmur with beginning cardiac insufficiency—factors which made her condition very unfavorable for ether or chloroform narcosis. Spinal anesthesia was employed. I was able to remove the tumor without pain, and the patient had an uninterrupted recovery.

I have employed spinal anesthesia in a large number of cases with satisfactory results. I use it invariably when I regard general anesthesia undesirable because of serious cardiac, pulmonary or renal lesions. That such use must necessarily increase the number of cases in which its administration will be followed by fatal results should be considered in making up statistics of its gravity.

140. **Preliminary Details of Operation.** The presence of the anesthetized patient in the operating room presupposes the thorough preparation detailed in the preceding paragraphs. A sufficient number of well-drilled assistants should have their duties assigned, so that the operation may proceed without confusion or delay. The necessary instruments, ligatures, dressings, sterilized water and sponges have been pre-

pared. In abdominal operations the number of sponges or pieces of gauze should be known, so that they may be accounted for before the wound is closed. It is also important to have a definite number of instruments, as both sponges and instruments, especially hemostatic forceps, have been left in the abdominal cavity. Every step of the operation, to the minutest detail, should be conscientiously watched, for, as the chain is only as strong as its weakest link, so an otherwise perfect aseptic procedure may fail through a single flaw. I have seen, after the most careful preparations for an operation, the operator place his silk sutures upon a syringe box; an assistant stroke his mustache, or a nurse use her handkerchief, or stroke her hair, each instance being a break which imperils the result.

141. **Arrangement.** The instruments should be placed at the right of the operator, so that he can reach them as needed. The sponges should be in the care of a nurse upon the opposite side. The sponges or gauze pads should be removed from the receptacle and passed with a pair of forceps to the operator or his assistant by the nurse. After being used they should be placed in a basin. The nurse dispensing the sponges should keep an accurate account of the number given out, with which those returned should correspond. The wound should not be closed until it is certain all sponges have been removed. It is well to have one large, broad piece of gauze for walling off the intestines, or several smaller pieces may be employed and the end of each secured with a pair of forceps. A basin of sterilized hot water should be alongside the instruments for the hands of the operator, and his principal assistant should have another.

142. **Positions of Operator and Assistants.** In an abdominal section I prefer to stand on the patient's left, with my assistant opposite; the second assistant gives the anesthetic; a third looks after the instruments, ligatures and sutures. One nurse attends to the sponges, a second is ready for any emergency and counts the sponges after they have been discarded, which count should tally with the one made by the nurse dispensing them. Where the condition of the patient is a grave one, it is advisable to have an assistant and nurse ready to employ intravenous saline transfusion should it be indicated.

143. **The patient's clothing** should be removed in order to prevent its becoming soiled during the operation. Separate and clean blankets should be wrapped about the upper part of the body and lower extremities. These should be covered with sterilized towels, and over all a sterilized sheet, in the center of which an opening has been made to expose the field of operation.

144. **Incision.** The linea alba is chosen for the site of incision in the majority of cases of abdominal section. A cut, varying in length from two to twelve inches, according to the condition for which the operation is done, is made with a sharp knife. When the abdomen is moderately distended with a growth, the first sweep of the knife should reach the fascia over the peritoneum. The operator and his assistant with long dissecting forceps pick up the peritoneum and cut it between them, thus

avoiding injury to the cyst, or, when the abdomen is undistended, a knuckle of intestine.

As soon as the peritoneum is opened, the atmospheric pressure carries the intestine out of the way, when the incision may be completed

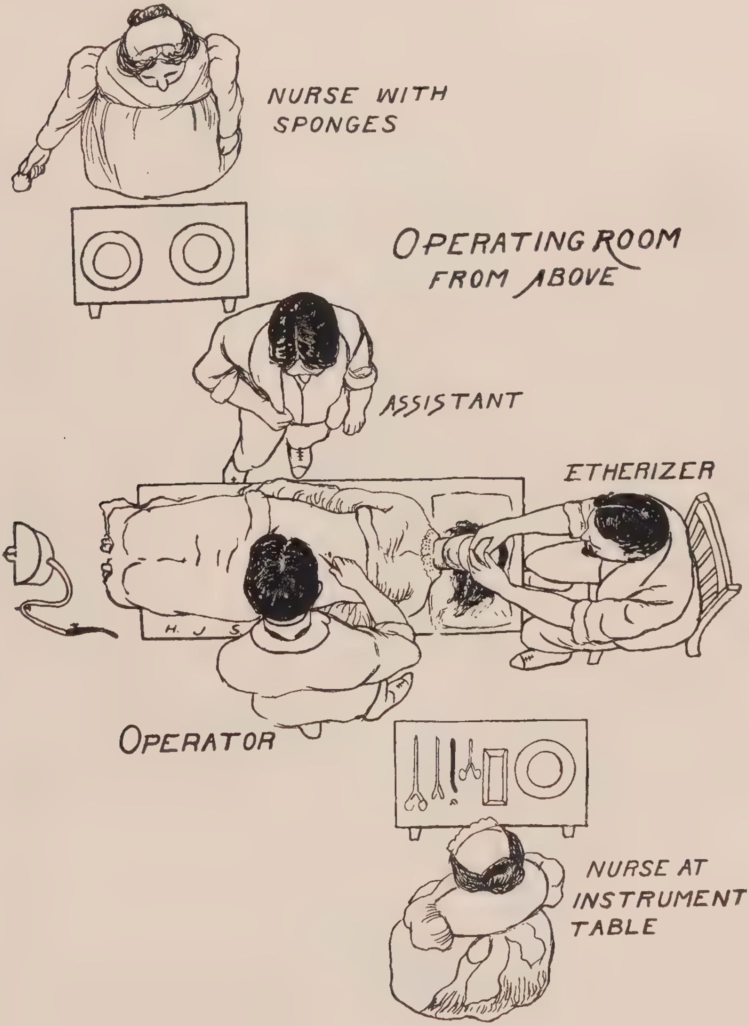


Fig. 147.—Arrangement of Tables and Assistants in Operating Room.

with a knife or with probe-pointed scissors, introducing two fingers as a guard. Should considerable bleeding occur after the first sweep of the knife, it can usually be controlled by pressure with a gauze pad. When this is insufficient, the bleeding vessels should be seized with hemostatic forceps.

The length of the incision has been a prolific source of discussion. It has but little influence upon the result. It should be sufficiently long to permit the object of the operation to be accomplished with ease and as little irritation as possible. A long incision, if properly united, will be as firm as a short one.

A combined transverse, or better, crescent-shaped and vertical incision, was reported at the International Congress on Obstetrics and Gynecology, held in Geneva in August, 1896, also described in a paper by Küstner in an article in September of the same year, and has been largely practised by Stimson and Cumston in this country. It consists of a cresent-shaped incision just above the symphysis, and, where possible, confined to the hair surface. It extends through the skin, superficial fascia, and aponeurosis. These tissues are drawn up, separating the aponeurosis from its attachment, to the pyramidalis muscles. The rectus muscles are separated in the median line, and the peritoneum incised vertically. This incision permits free access to the pelvic viscera and is satisfactory unless a large growth is present which will require a longer incision. The advantages of the procedure are that the subsequent growth of the hair hides the incision; the probability of hernia is lessened, as the suture closing the peritoneum and muscle wall is at right angles

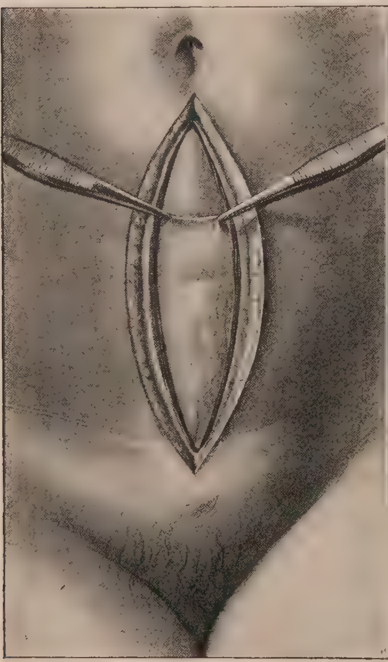


FIG. 148.—Abdominal Wall Incised; Peritoneum Picked up by Dissecting Forceps.

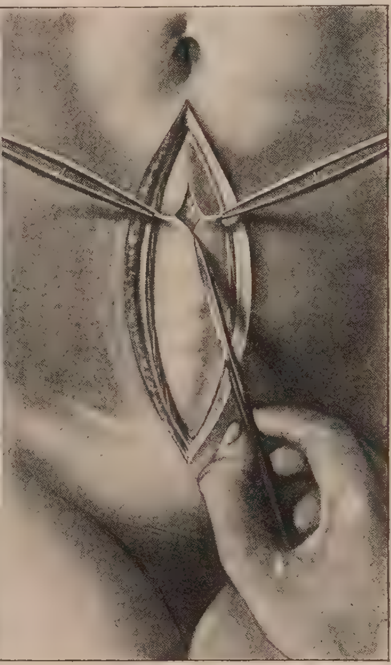


FIG. 149.—Peritoneum Incised.

to that of the aponeurosis. The disadvantages are: the increased bleeding from cutting across vessels and the inability to avoid always the occurrence of hematoma either below or above the aponeurosis. Where there is much disposition toward oozing, it is better to insert one or two small drains for the first two days.

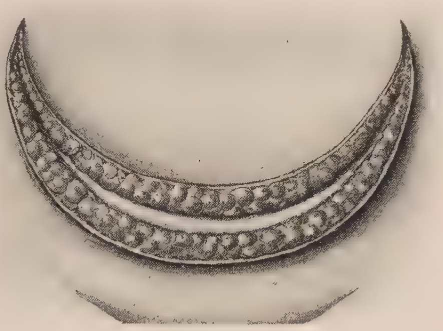


FIG. 150.—Crescent Incision Exposing Aponeurosis.

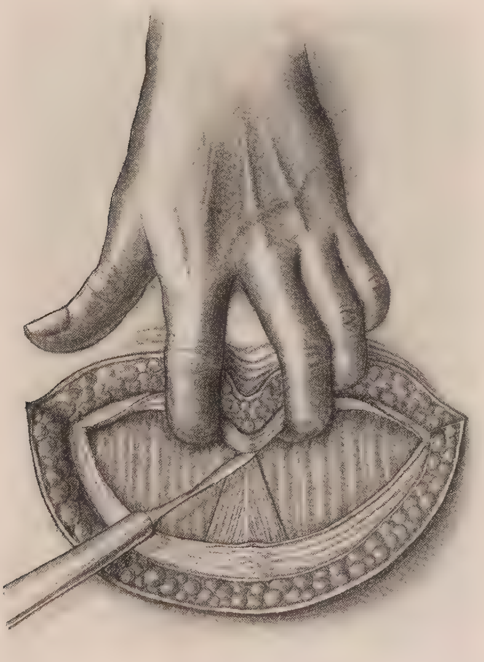


FIG. 151.—Aponeurosis Excised, Showing Pyramidalis Muscles.

145. Adhesions. In inflammation complicating a cyst it may be difficult to determine when we are through the peritoneum. In case of doubt it is better to continue the incision until the cyst is opened, when the line of union can be determined more readily. It is well to remember that at the umbilicus the peritoneum is united closely to the overlying tissue, and this fact may be utilized in cases of uncertainty. As far as possible, separation of adhesions should take place under the eye, by drawing them down to the incision. Vascular adhesions and every bleeding vessel should be secured with forceps or should be ligated.

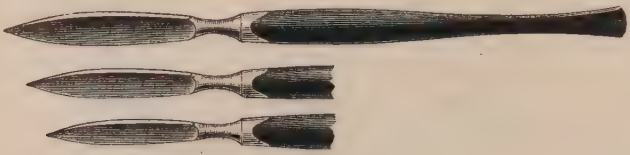


FIG. 152.—Scalpels.

With the application of forceps the number of necessary ligations will be reduced, as often the pressure will prevent bleeding subsequently. All large bleeding points should be secured by ligature before the wound is closed. In short, firm intestinal adhesions the greatest safety is assured by keeping close to the cyst. In some cases it may be necessary to cut into the cyst, leaving a portion attached to the intestine, always taking the precaution, however, to remove its inner, secreting surface. Frequently the worst adhesions the operator will meet are associated with infective processes in the tubes, or ovaries, or in relation to myomatous growths of the uterus. In both of these conditions the adhesions may be so firm as to require the use of the scissors for their separation. All bleeding vessels should be secured and where possible the raw surfaces sutured.

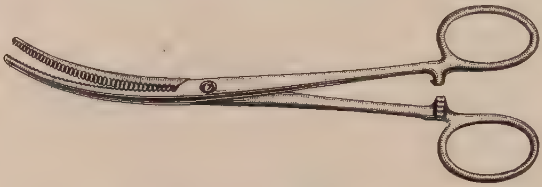


FIG. 153.—Pressure Forceps.

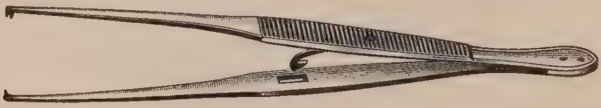


FIG. 154.—Long Bladed Dissecting Forceps.

146. Toilet of the Peritoneum. In the removal of large cysts care should be exercised that their contents do not escape into the abdomen. If the contents are uncontaminated, consisting of thin serous fluid, they should be removed by sponging only. It is difficult for me as an operator to get over early impressions. My education leads me to resort to abdominal irrigation, preferably with normal salt solution, whenever infection is possible, but experience has demonstrated that patients do equally well when pus is sponged out with dry gauze pads. Without doubt, wherever it can be done, the general surface should be protected by gauze packing. This will prevent the necessity of extensive cleaning. It is a serious question whether the measures we often institute in the name of toilet of the peritoneum are not more prejudicial than helpful. When irrigation is done, it is most effectively accomplished by pouring the belly full of normal salt solution, churning it about, pressing it out, and removing the remainder with sponges. All bleeding points must be secured. If there is oozing from the surface, sponges wrung out of hot water should be packed firmly upon it until the operation is completed, when they can be removed. If bleeding still continues, the surface should be sponged with a hot solution (10 per cent.) of ferripyrin, sprayed with a 4 per cent. solution of antipyrin, or infiltrated with a solution of one part (1:1000) adrenalin chlorid to three parts sterile water, or the latter may be sprayed forcibly against the bleeding surface. Should hemorrhage be persistent, a gauze pack affords an efficient means of control.

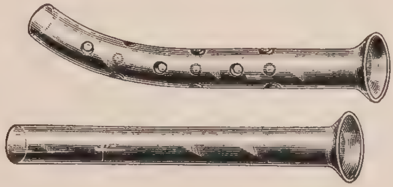


FIG. 155.—Glass Drainage-tubes.

147. Drainage was formerly a momentous question.

Keith's rule that it should be used only when there was something to drain was a good one, but with improved methods of technic we can depend more and more upon the natural absorptive power of the peritoneum. The use of the glass drainage-tube, which was formerly a matter of routine, is now more honored in the breach than in the observance. When a glass drainage-tube is used, it should be from six to eight inches long, with a number of small perforations at the lower extremity. These openings should be small, otherwise portions of intestine or omentum slip into them and become strangulated or render the removal of the tube painful and difficult. The openings should be smooth, and beveled at the expense of the outer surface. The lower end of the tube should be open; the external end should be provided with a flange, over

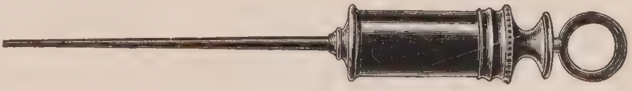


FIG. 156.—Uterine Syringe for Cleansing Drainage-tube.

which a piece of rubber dam may be placed to prevent soiling the dressings. The caliber of the tube should not exceed one-third of an inch. The use of the drainage-tube required most exacting care upon the part of the nurse and physician. Every precaution had to be exercised to prevent its becoming a gateway for infection. It needed cleansing every half hour or oftener so long as there was any discharge. This was accomplished by the use of a suction tube which reached to the bottom of the tube, or, better, by tube forceps and pledgets of sterilized absorbent cotton. By either method in spite of every precaution, micro-organisms in large number found ready entrance. The frequent cleansing of the tube was avoided by passing a strip of sterile gauze to its bottom, which acted as a wick.

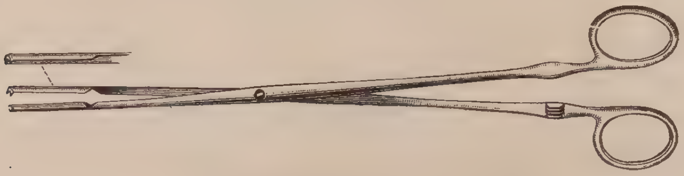


Fig. 157.—Tube Forceps For Cotton Pledgets.

Objections to the glass drain arose because: (1) It obliged the patient to remain upon her back; (2) unless carefully placed it caused sufficient pressure upon the rectum to produce ulceration or even a fecal fistula; (3) it increased the difficulty in maintaining the wound aseptic, and afforded ingress to pathogenic germs, either through its cavity or along its sides; (4) it rendered the abdomen weak and increased the danger of ventral hernia; (5) there was danger of the formation of a sinus which was long in closing. It was found the frequency with which drainage was thought to be required could be lessened by the introduction of large quantities of normal salt solution. This diluted the infectious material and rendered it more readily controlled by the peritoneum. Later experience has demonstrated that such cases do equally well by carefully walling-off pus collections with gauze before they rupture and then thoroughly removing the pus and blood with dry gauze. The peritoneum, if given an opportunity, will take care of infection; the means used for the removal of infection cripple the antagonistic processes of the peritoneum. Where drainage is deemed advisable, it should be used in the great majority of cases through the vagina, either by a twist of gauze or a split rubber tube.

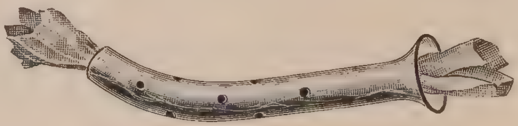


Fig. 158.—Gauze Wick in Drain.

Gauze Drain. Drainage has been accomplished by a twist of gauze, or, where there was much oozing, by gauze pressure. The Mikulicz drain consisted of a piece of gauze within which strips of gauze were packed. A string was tied to its center, and it was placed in the bottom of the pelvis. The strips ordinarily were marked, to designate the order in which they were introduced. The pain in removing was greatly decreased by covering the drain with rubber tissue except at its extremity. Drainage, whether by tube or gauze, is of but short duration, and its influence is confined to a limited area. Lymph exudate soon walls it off as a foreign body from the general cavity. Gauze is very efficacious as a tampon. Its pressure arrests hemorrhage and promotes the formation of exudation, which closes oozing vessels and bars the avenues of infection.

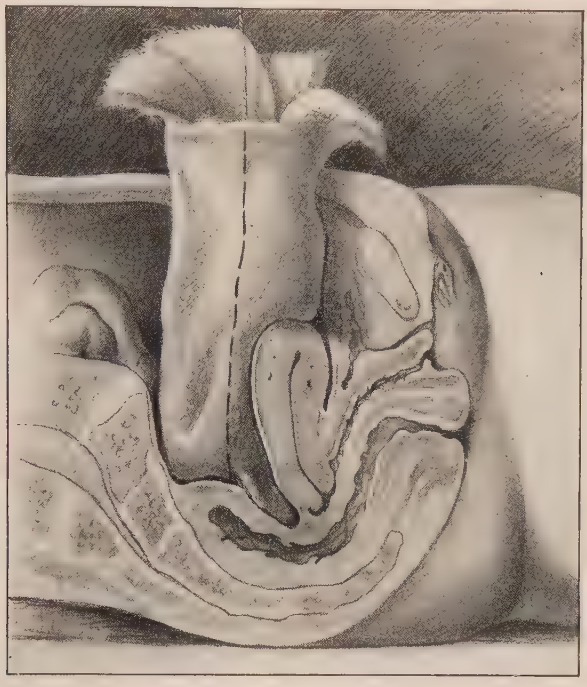


FIG. 159.—Mikulicz Drain.

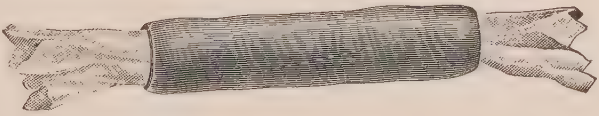


FIG. 160.—Gauze Drain Covered with Rubber Tissue.

Where Placed. The drain, whether glass tube or gauze, was generally placed in the lower angle of the wound, though it could be placed between sutures at whatever part of the wound was most favorable.

As has been mentioned, where possible, it should be through the vagina, for the strength of the abdomen is not weakened then.

Postural Drainage. The uninjured peritoneum is an actively absorbent surface. Clark utilized the knowledge of this fact to avoid the introduction of a drain by elevating the foot of the bed eighteen inches for twenty-four to thirty-six hours. The fluid gravitated away from the injured surfaces. The danger of infection was lessened by active irrigation with a large quantity of normal salt solution before the wound was closed. The activity of any pathogenic material remaining within the abdomen was diminished by dilution through the retention of a considerable quantity of the solution when the wound was closed.

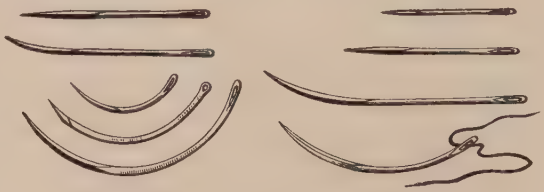


Fig. 161.—Curved and Straight Needles.

This position also decreases the pain following an operation by the lessened quantity of blood sent into the vessels of the elevated pelvis. The pendulum has now swung backward, and we elevate the upper part of the body and favor the accumulation of fluid in the pelvis, from which it is removed by gauze wicks through the abdominal wound, or, better still, by an opening into the vagina. The latter channel of egress should be employed whenever possible, because it favors by posture the evacuation of the most dependent portion of the tract and the danger of sinus or hernia is lessened.

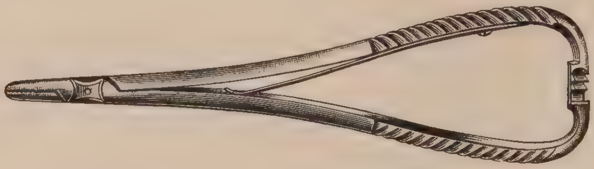


Fig. 162. —Needle Forceps.

148. Closure of the Wound. Before sutures are introduced, the omentum is generally drawn over the intestines. Formerly, when extensive adhesions or purulent discharges were present, the belly was left filled with a sterile normal salt solution. While we now urge the dry gauze sponge, it is difficult not to resort to the flushing with the normal salt water when abscess cavities are ruptured. The wound can be closed with through-and-through interrupted sutures or buried sutures in separate layers. Interrupted sutures of silk, silkworm gut, silver wire, or chromic catgut are introduced through the entire thickness of the abdominal wall, about three-fourths to one inch apart, including one-eighth of an inch of the peritoneal and one-fourth of the skin surface on each side. Each suture is secured with a pair of hemostats. After all are introduced, the gauze pad placed over the intestines is removed, the cavity inspected, and the sutures tied. Care must be exercised that a knuckle of intestine or a piece of omentum is not caught by the sutures. The most important consideration for the future of the patient is the union of the aponeurosis, for upon its accurate union depends the subsequent strength of the abdominal wall.

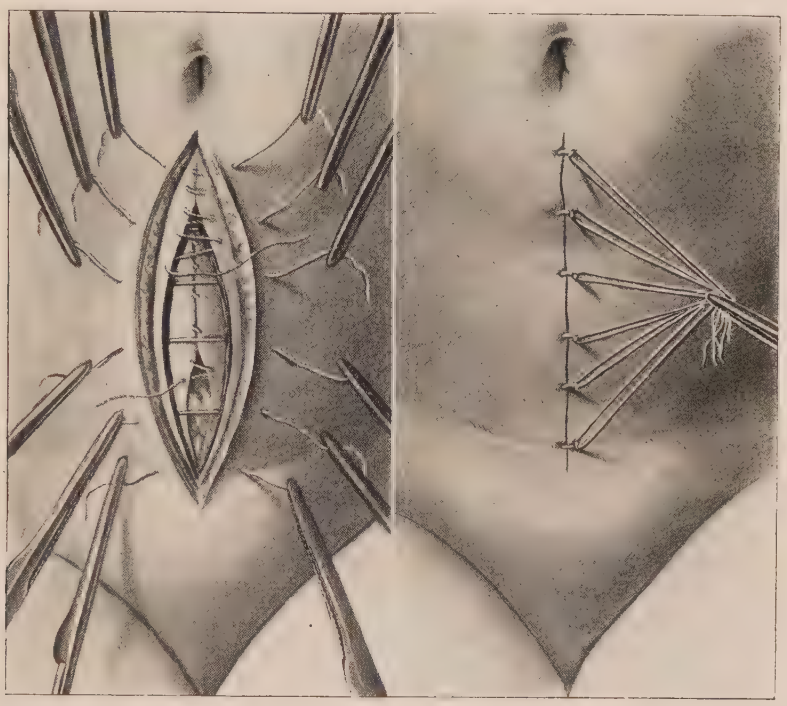


FIG. 163.—Peritoneum Nearly Closed with Continuous Catgut. Silkworm-gut Sutures through all Structures above Peritoneum. Aponeurosis Being United with Continuous Suture of Catgut.

FIG. 164.—Silkworm-gut Sutures Tied.

While the above described single suturing for all the structures will often afford a good wall, it too frequently results in a weakened ventrum which gives way with increasing corpulence and becomes the site of hernia. After many trials with different methods of suturing I have accepted the following routine as affording uniformly the best results: Begin external to the aponeurosis at the upper angle of the wound; carry a No. 1 chromic catgut suture through all the tissues below the aponeurosis at the right side of the wound, secure the end of the suture by hemostat, and ask the assistant to maintain at least three inches of it externally. With tissue forceps pick up and pass the suture through the peritoneum only upon the left side. The subsequent turns of the suture are confined to the peritoneal margins of the wound until the lower angle is reached when the suture is brought through the aponeurosis at the left side of the incision. (Fig. 163.) With the Reverdin needle silkworm-gut sutures are now passed about one-half to three-fourths of an inch apart through all the structures above the peritoneum, and the ends secured with pressure forceps. After drying the surface, begin at the lower angle of the wound with the remaining portion of the catgut suture, which closes the peritoneum, and return closing the aponeurosis only, until the upper angle is reached, then tie to the end at the right side of the wound. This method insures the accurate apposition of the aponuerosis and the restoration of the rectus to its normal sheath. The silkworm-gut sutures are now tied with moderate pressure, insuring the obliteration of dead spaces, and the muscle surface of the wound is placed in a splint until the union can be secured. The ends of the silkworm-gut sutures should be left long, as thus they promote drainage from the wound and facilitate their removal. Between each of these sutures the skin edges should be approximated by a plain catgut suture. These sutures can be sponged away when the silkworm is removed. The combined cresentic and vertical incision is closed by a continuous suture for the vertical incision, which, beginning above, external to the muscle, takes up the peritoneum only until the lower angle is reached. It then emerges through the rectus and returns through the edges of these muscles until the upper angle is reached where it is tied to the starting end of the suture. This suture of chromic catgut is drawn only sufficiently tight to hold the surfaces in apposition. A second continuous suture brings into apposition the edges of the aponeurosis. A third of plain catgut will hold in contact the skin edges. This suture can be sponged off at the first dressing ten days after the operation. It may be subcuticular but a continuous suture through the skin edges, unless drawn tightly, is equally efficient and more quickly introduced. The skin edges accurately apposed and the incision confined to the hair surface, the scar is completely obscured in a few months. Great care must be exercised to control all bleeding vessels, and, where there is a disposition to oozing, drainage should be installed to prevent the formation of a hematoma and its subsequent infection.

149. **Dressing.** After the wound is closed it is washed with alcohol and a sterile towel is pressed upon it, while the remaining surface of the abdomen is being cleansed and dried. The wound surface should be dressed with several layers of plain sterile gauze. When the sutures are left long, the first pieces of gauze should surround them and remaining portions be placed over the ends. The gauze should be covered with a pad of gauze and cotton or wood wool. The dressings are held in place with tapes attached to pieces of plaster, three on each side, and, finally, a sterilized bandage. The use of the tapes affords a ready access to the wound without annoyance to the patient.

150. **Postoperative Treatment.** Too often, both by the laity and

the physician, the struggle for life is regarded as won when the operation has been completed, although in many cases this period but indicates the beginning of a grave battle. It is true that much may be done to lessen the trials of the after-period by careful study and preparations of the patient for operation, by the greatest expedition in the operation consistent with the most conscientious discharge of every detail of the procedure, the limitation of the amount of the anesthetic, and the early and careful regulation of the circulation. After the operation has been begun or is half completed is no time for the surgeon to stop and hold a consultation as to what shall be the next step. He must have prepared himself by study, meditation, and experience for every possible complication and be ready to meet it when it arises. Postoperative or after-treatment comprises the consideration and exercise of those details which promote comfort, advance convalescence, and further the restoration of the individual to normal health. Much of this work the surgeon must delegate to attendants, but they must be governed by his watchfulness and advice. He should not fall into the habit of a routine treatment, nor allow others to, but should meet the necessities of the individual case.

Under the old method of treatment where many cases had a glass drainage-tube inserted, it was necessary that the patient should be restrained to the dorsal position. Unless the patient is exceedingly nervous, very restless, apparently suffering intense pain, it is better to give no anodyne. When she is nervous, or complaining, an enema of tincture of valerian fʒii–iv, with tinctura opii deodorati gtt. 20 to fʒj may be given, diluted by ℥ii salt solution.

151. Comfort of Patient. The patient is transferred from the operating to the private room, where she is placed in bed, covered warmly, protected from draft, and kept quiet; the room should be darkened. If the operation has been protracted or the patient is depressed, hot-water bottles should be placed about her to maintain the body heat. These bottles should be corked tightly and a blanket should be placed between them and the skin. The patient, unable to understand or to make known her discomfort, may be badly burned if such precautions are not exercised. It should be recognized that the patient when profoundly shocked has a lowered resistance, which will cause her to burn at a lower temperature than would occur in health. As she recovers, it becomes very irksome to remain in one position. An attentive nurse can greatly add to her comfort by passing her hands under the patient so that the cool air reaches the heated back, by changing her from one side of the bed to the other, and by keeping the clothing under her smooth and dry. Unless there is some special contraindication, as the presence of a drainage-tube, she may be turned upon her side. Indeed, the early and frequent turning of the patient will prove beneficial. It promotes peristalsis, favors the early passage of flatus, and lessens the danger of unfortuate intestinal adhesions. The nurse should support the patient's back and limbs with pillows. One of the earliest symptoms of which the patient complains is intolerable thirst. It is better to limit the quantity of liquid for the first few hours to small quantities of hot water—a half ounce every hour, given with a horn spoon, as the china cup would burn the lips. Ice should not be given; it increases the thirst and the patient will not be contented without a piece constantly in her mouth. Both mouth and stomach soon become irritated. When the patient does well, she can have a cup of tea or coffee on the morning following the operation, small quantities of ice-water or soda-water, equal parts of effervescent vichy and orange-juice, a teaspoonful of beef-juice every three hours; and on the second day light food, and by the end of the week a generous diet.

152. **Vomiting** is likely to follow the anesthetic, the early administration of liquids or food by the stomach, or it may be the precursor of peritonitis. Its occurrence should be an indication to discontinue everything by the mouth. Enemas of warm water, six to eight ounces, may be given to assuage thirst, and when the patient is in need of nourishment, nutrient enemas may be given every three or four hours. Nausea and vomiting occur very frequently after an operation and may continue several days. The ejected material may be the fluid which has been ingested, or bile, mucus, or the contents of the small intestine. The application of a mustard-plaster and an enema of 30 grains of chloral and 1 dram of potassium bromid in 2 ounces of warm water will often be sufficient to quiet the irritability. If the patient is constantly retching, it is better to give a large draft of water with 1 dram of bicarbonate of soda, a cup of weak tea, or some soda-water.

Professor Hare has suggested 2 grains of acetanilid and 1/2 of a grain of caffein citrate, to be repeated in two hours. I have found this formula of advantage in vomiting following etherization. Other remedies of more or less value are: cocain (4 per cent. solution), 3 drops every hour; tincture of nux vomica, 2 drops every hour; 2 drops of compound tincture of iodin and 1/8 of a grain of carbolic acid every hour; or 1 drop of Fowler's solution every half hour. The earlier the bowels can be evacuated, the sooner will the offensive material be removed; hence the most effective treatment will be the administration of a saline, or, when it cannot be retained, the use of calomel alone or in combination with bicarbonate of soda (gr. j–ij of the latter to from 1/6–1/4 gr. of the former) every fifteen minutes until gr. j–iss of calomel are taken, when magnesium sulphate 1 dram in syrup of ginger and cinnamon water is given every hour until the bowels are moved. In frequent vomiting a seidlitz powder is very efficient, for if vomited, it generally empties the stomach, and when retained, starts the current through the canal. The powder should not be given in the usual manner, but the sodium carbonate portion should be dissolved in water f℥iij, the smaller or tartaric acid powder dropped upon this dry and given immediately. The patient should be encouraged to retain this as long as possible. If vomited, the stomach is well cleansed and generally a portion of the drug passes the pylorus to exercise a good influence upon the intestine. A second powder may be given in the same manner a half hour later if the first is ejected.

If the intestine is distended and has not yielded to enemas or to the purgatives suggested, and the patient is constantly vomiting small quantities of dark fluid, nothing will give quicker or more lasting relief than irrigation of the stomach through a stomach-tube. When it is evident that the vomiting is an indication of peritonitis, it is wiser to discontinue purgatives and be content with lavage. No food, not even water, should be given by the mouth, and peristalsis should be arrested by small doses of morphin hypodermically. Rectal feeding may be required because of irritable stomach and the enfeebled condition of the patient, and especially in conjunction with the treatment suggested for peritonitis.

Peptonized milk or broth may be given every three or four hours. When the patient is much depressed, a normal salt solution and whisky or bovinin in combination may be given. When rectal feeding is practised, the bowel should be irrigated once or twice daily.

153. Tympanites may be the result of a passive collection of gas in the intestines, or may indicate the development of peritonitis. The early passage of flatus is always an encouraging symptom. The sensation of distention may be promptly met by the use of an enema of

Magnesium sulph.,
Glycerin,
Water, } ....āā ℥j.

If relief is not secured, an enema of two tablespoonfuls of turpentine beaten up with the yolks of two eggs and strained into a quart of soapsuds should be administered. Keith recommeds an enema consisting of 6 grains of quinin dissolved in 4 drams of whisky and two ounces of warm water, to be given every two hours until three doses have been administered. This prescription stimulates the nerve-centers and favors peristalsis. If peristaltic action is marked, but reversed, lavage should be employed, a hypodermic injection of morphin given, and followed, after a rest of three or four hours, by a repetition of the quinin. The most effective agent to influence increased peristalsis is an enema consisting of an ounce of powdered alum dissolved in a quart of hot water.

154. Severe shock should be combated by the use of artificial heat, enemas of coffee and stimulants, suppositories of ice, elevation of the foot of the bed, bandaging the limbs, and the injection of normal salt solution into the buttocks, beneath the scapula, or directly into a vein. A hypodermic injection of strychnin (gr. 1/30 to 1/6) should be given according to the urgency of the condition, and followed by some aseptic preparation of ergot. Ergone in 20-minim doses is valuable, or it may alternate with (1:1000) solution adrenalin chlorid, 20 minims every two hours. Atropin sulphate (gr. 1/100) twice daily will be servicable in controlling the vessels. Where loss of blood has been great, renal secretion arrested, or shock profound, the intravenous injection of two to three pints of a 1 per cent. salt solution is the most effective agent which can be employed.

Immediately after an operation the patient should be isolated from anxious friends and disturbed as little as possible consistent with proper measures.

155. Anodynes. The patient should be encouraged to bear pain without an anodyne. Moderate distress may be allayed by the rectal use of chloral, 30 grains in two ounces of warm water. When the pain is very severe, and accompanied with marked restlessness, a hypodermic injection of 1/8 to 1/4 grain of morphin may seem the less serious factor. Morphin decreases peristalsis and favors tympanites, and consequently should be avoided if possible. Whenever it is evident that peritonitis has developed, and purgatives are ejected as fast as given, morphin with lavage should be considered our sheet anchor and be given for effect, giving an initial dose or gr. 1/4 to 1/3, and following with 1/16 to 1/8 every three hours.

156. **Internal hemorrhage,** if the technic is perfect, should not occur. Its existence will be indicated by paleness of lips, feeble or absent pulse, sighing respiration, and clammy perspiration. The use of strychnin or the injection of salt solution favors the increase of hemorrhage. The only proper treatment is prompt reopening of the wound and ligation of the bleeding vessel.

157. **Peritonitis** will occur early or late according to the virulence of the infection. The aim of the operator, of course, is to avoid the possibility of its occurrence, but in many instances the patient may have been infected prior to the performance of the operation, when all the skill of the operator could not remove the sources of further development. It is likely to occur in acute gonorrheal and septic infection of the tubes and pelvic structures, in large accumulations of blood, either prior or subsequent to operation, which have been infected from their juxtaposition to the intestines, and soiling of the peritoneal cavity by the contents of dermoid, glandular, and papillary ovarian cysts. Peritonitis is characterized by increasing tenderness of the abdomen, decreased peristalsis, tympanites, frequent vomiting, especially when occurring on the second and third days; rapid, feeble, thready pulse, and more or less elevation of temperature. The vomited material may be considerable quantities of dark-greenish, bitter, and ofttimes foul-smelling fluid—apparently more is vomited than the patient has taken. The tongue is dry, the patient complains of intense thirst, and is constantly crying for water and ice. The administration of purgatives in these cases is generally ineffective, for the reason that the patient vomits or regurgitates everything as soon as taken. Enemas are of little value, as they only empty the lower bowel. The proper plan of treatment is to wash out the stomach with the stomach-tube, give the patient a hypodermic injection of morphin, gr. 1/8 or 1/4, repeating this in doses of gr. 1/12 to 1/6 every two or three hours, keeping the patient under its influence. As all efforts at increasing the peristalsis are ineffective, we aim to place the intestines in a splint, and remove the offensive material from the stomach and upper part of the intestine by lavage. Frequently under this course we will see patients who seem to be almost moribund become quiet, and comfortable, resting easily. After two or three days there will be a profuse evacuation of the bowels and the patient go on to recovery. The strength of the patient during this period should be maintained by hypodermic injections of ergone, strychnin, hypodermoclysis of normal salt solution in the breasts and the buttocks and rectal feeding. To place the patient in the Fowler position with continuous irrigation of the bowel, as suggested by Murphy, will be of great value. If there is reason to suppose that an accumulation of fluid within the abdominal cavity has

occurred a vaginal incision should be made for its evacuation or the abdominal wound reopened and drained by gauze wicks. The instillation of salt solutions ʒss–j per minute will result in free irrigation of the peritoneal cavity through such a drain. Having begun this treatment for peritonitis the attendant should not be in too great haste to secure an evacuation of the bowels, as oftentimes the flame may be relighted by the too early administration of a purgative.

158. Wound Infection. It is the aim of the operator to secure healing of the wound by first intention. Every safeguard is thrown about the operative procedure in order to secure this object. Occasionally, however, in spite of all precautions the wound becomes infected from the material that is taken out of the abdominal cavity, or in closing the wound a vessel is punctured and hemorrhage of considerable quantity takes place into the tissues directly over the peritoneum. Even if the depth of the wound does not contain pathogenic germs, such an accumulation is likely to become infected from its close proximity to the intestine, and three to six or even ten days after the operation the patient may develop a temperature, complain of more or less tenderness over the abdomen and the parts will be swollen. Where the abdominal walls are thick it will be difficult to recognize and determine the existence of any accumulation. It is better, however, where careful examination discloses the absence of any trouble within the pelvis or other portion of the body to account for the elevation of temperature to make an exploratory puncture through the structures sufficiently deep to reach the space between the muscle wall and peritoneum. If the operator fears to penetrate the peritoneum after making the incision through the aponeurosis, he can enlarge the opening by introducing a grooved director. The early evacuation of an accumulation will prevent the suppuration and burrowing of the pus and will promote rapid convalesence. The infection in some cases may have been carried into the depths of the wound in the removal of the sutures.

159. Parotiditis. Inflammation of the parotid glands is a complication of infrequent occurrence. However, it formerly occurred so frequently that there was supposed to be some intimate relation between this gland and the pelvic structures that caused metastasis of inflammation. It is now recognized, however, that its inflammation and infection are due only to the fact that this gland is more susceptible to the influence of some forms of bacteria than other structures of the body. Then, too, it is recognized that in the majority of instances the infection reaches the gland through the mouth and is due to local rather than general conditions. Where the patient is suffering from peritonitis or septic conditions, with dry tongue, decreased amount of saliva, the patient should be watched carefully and the mouth kept clean to prevent the entrance of infections to this gland. Where the gland shows signs of developing inflammation, the most effective treatment is to apply an ice-bag over it at once, keeping the ice constantly applied, thus limiting the extent of the inflammatory process; where suppuration occurs the pus should be promptly evacuated by incision.

160. Ileus is an obstruction of the intestine that may take place one or more weeks after an abdominal operation. It develops by nausea and vomiting. The latter continues with ejections of stercoraceous material, intense pain, profound depression, shock, rapid pulse, and haggard, anxious expression. If unrelieved, it terminates in the collapse and death of the patient. It may be due to paralysis of a portion of the intestine from infection; from adhesions constricting and making difficult the passage of contents of the intestine through the tract; or twisting of the gut, forming what is known as a volvulus or intussusception. If the patient is not relieved by lavage and hypodermic injection of morphin, the wound should be reopened and the condition overcome. In the majority of cases merely opening the abdomen, freeing the adhesions, and reestablishing the caliber of the gut, will be sufficient to accomplish relief. This procedure, however, should be done early, as otherwise the patient will be so exhausted that it will be ineffective.

161. **Phlebitis** generally affects the saphenous vein, sometimes extending into and involving the femoral and iliac. This infection may occur at a later date in a patient who otherwise has exhibited every indication of a normal convalescence. A week or even two weeks after the operation has been performed the patient complains of intense pain in the calf of one leg, most frequently the left. The pain extends up along the course of the vein and most frequently is associated with tenderness over the saphenous and the iliac veins. The patient should be kept perfectly quiet. The limbs should be raised and bandaged. The course of the vein should be smeared over first with some ichthyol and belladonna ointment, taking ichthyol and extract of belladonna āā ʒj, lanolin ℥j, wrapping the limb well with cotton, and applying a bandage, making moderate pressure its entire length. The limb is then elevated and kept more or less immobile by placing a sand-bag on either side of it. An ice-bag should be applied over the saphenous and iliac veins. Even after the acute symptoms have subsided the patient should be kept in the recumbent position and the limb perfectly quiet, as it is impossible to say in any individual case what the termination may be. A clot may become organized, obliterating the affected vein. It may break down, indicating suppuration and the formation of a localized abscess. Fragments of the clot may disintegrate, are carried into the circulation, and form emboli, blocking up the circulation to important viscera and giving rise to a fatal termination. The nutrition of the patient should be maintained to the utmost degree.

162. **Precautions in the Use of the Hypodermic Syringe.** In the use of the hypodermic syringe there are four sources of infection: (1) The hands of the operator; (2) the instrument; (3) the fluids to be injected and (4) the skin of the patient. The syringe is difficult to keep aseptic. The metal instrument may be boiled in a soda solution. If you have a glass instrument, the piston should be withdrawn and it and the barrel should be placed in a 5 per cent. solution of carbolic acid; the needles, if platinum, may be passed through an alcohol flame, but ordinary needles would be destroyed, and, therefore, they should be boiled. Solutions of atropin, morphin, cocain, strychnin, and ergotin favor the development of

bacteria, and when kept for some time, will be found swarming with microorganisms. Cocain may be kept in a (1 : 10,000) bichlorid solution; the others named may be preserved by the addition of a few drops of carbolic acid to the ounce of solution. Probably the safest method is to make up the solution of morphin, atropin, or strychnin from tablets, which can be dissolved by boiling without affecting the action of the drug.

163. **Catheterization.** No procedure, fraught with so much discomfort to the patient when carelessly employed, is so frequently performed with little consideration as the use of the catheter. Not only are distressing symptoms produced by infection of the urethra and bladder, but serious results from extension of the disease to the ureters and pelves of the kidneys. Fortunately, the female urethra is short, and permits the use of a glass catheter, which can be kept clean. The instrument should be scalded before and after being used, and should be kept in a 5 per cent. solution of carbolic acid during the intervals. It should be free from cutting edges.

The labia should be separated to expose the urethral orifice, when the vestibule should be sponged with a solution of boric acid or sterile water. The catheter should be gently introduced being held between the thumb and middle finger of one hand, while the index finger is placed over its opening to prevent the premature discharge of urine. The instrument is carried upward and backward as the patient lies upon her back. When it enters the bladder, as is evident by the absence of resistence and the appearance of urine in the instrument, its external end should be brought over the receptacle between the limbs of the patient. Should the quantity of urine be larger than the reservoir will hold, the finger placed over the end of the catheter will permit it to be emptied and replaced. The bladder can be completely emptied by making pressure over the lower abdomen with the unoccupied hand. With the discharge of the last urine the finger should be placed again over the end of the catheter to prevent the urine flowing over the vulva or soiling the bed. When pressure has been made over the abdomen, the finger should be so placed before the removal of the pressure as to prevent the aspiration of air into the bladder. Should the urethra become painful or irritation of the bladder occur from frequent use of the catheter, the bladder should be irrigated with a hot boric-acid solution. The urethra should be treated by the instillation of 2–5 per cent. solution of argyrol twice daily. After an abdominal operation, the catheter need not be used for twelve hours unless the patient experiences much distress.

164. **Removal of sutures** in an ordinary case should occur from the seventh to the tenth day. If the patient has had a complicated convalescence, the union will not be so firm, and it would be better not to remove the sutures until the end of two weeks. If they are pulling and causing pain, a part of them may be removed. The same care regarding cleanliness and avoidance of sources of infection should be practised as in the operation. Leaving the sutures long (see Fig. 92) will facilitate their removal and dispense with the necessity for forceps to lift up the knot. All the sutures should be cut before any are withdrawn, then the long ends

may be gathered up and, bracing the wound with the fingers of the other hand, they may all be withdrawn at once, thus giving the minimum of discomfort. The wound should be dressed as in the beginning.

165. Leaving the Bed. The length of time the patient shall be confined to bed after an operation necessarily varies with the gravity of the procedure.. Of late years some operators have advocated getting the patient out of bed the second day. This plan may do no injury when the operation is a simple one and the incision short; but the majority of patients coming to operation will, I am convinced, profit by the rest in bed for a longer period during the convalescence. In uncomplicated cases, I allow the patient to sit up for a few minutes at the end of two weeks. In complicated operations or in disturbed convalescence, it is better that the patient should be kept recumbent for seventeen to twenty-one days. When the patient sits up it should be for but fifteen or twenty minutes, and preferably in a chair, as the strain is less than if she is supported by a bed-rest. The time should be increased daily.

166. In plastic operations the same precautions as to cleanliness must be observed. Sponging can be replaced by the use of continuous irrigation. The parts may be dusted with acetanilid or iodoform and boric acid. The parts should be dressed with sterilized gauze held in place by a bandage.

Vaginal irrigation should not be practised during the first forty-eight hours subsequent to an operation, for it interferes with the sealing of the wound by plasma. The patient should be confined to bed at least two weeks, and in perineal operations three weeks are preferable. In combined uterine, vaginal, and perineal operations the internal sutures, if non-absorbable, should remain for three or four weeks. I prefer chromic catgut for all plastic work, for the reason that the patient is spared the discomfort of the removal of sutures, and the newly united tissues are not subjected to the strain.

FUNCTIONAL DISORDERS.

167. Menstruation, as the first function of the genital tract to appear, necessarily becomes a barometer for determining any disordered action of the genital organs. Schaeffer found menstruation occurs in 28 per cent. of virgins without disturbing symptoms. Local symptoms appear in 28 per cent. without serious significance, but in 14 per cent. they are so severe as to deserve the designation of pathologic.

The symptoms most frequently mentioned are exhaustion, sense of weight, headache, loss of appetite, and local pain. These are so frequently associated in varying forms with menstruation as to be known as the *molimina menstrualis* and are present as: 1, local pain; and 2, symptoms in remote organs.

Local pain results from uterine contractions which are not continuous, but vary from cramp-like recurrences to pronounced paroxysms. These attacks were formerly attributed to accumulation of blood in the uterus. The pain in one-third of the cases is pre-menstrual. In a second third it continues with the menstrual flow. In many cases a sparse menstrual flow is associated with agonizing pain. That the entire pelvic organs sympathize with the menstrual hyperemia is evidenced by distention of the abdominal veins causing a sensation of weight and pressure, heaviness and aching of the legs, and frequently varicose veins.

Symptoms in remote organs are: loss of appetite; nausea and vomiting; pressure at the pit of the stomach; salivation; eructations; headache; typical migraine; dizziness; distressing sleep; swimming before the eyes; noises in the ears; ascending globus; palpitation of the heart; irregular pulse; air hunger; mental anxiety; hot flashes; sudden outbreaks of perspiration; shiverings; and cold feet.

Such psychic phenomena as excitement, depression, variations in the voice, in the joy of life, capacity for work, and in the intelligence; hysteric and epileptic seizures and choreic attacks were formerly regarded as nervous or reflex manifestations. Now we realize that they are largely due to the increased arterial tension incident to the menstrual cycle. While it is true that the majority of women are to a degree handicapped by the occurrence of menstruation, there are some who feel at their best and have the greatest capacity for work during the period.

168. Vicarious menstruation is the designation for want of coordination in the internal secretions or in their action on the vasomotor system which leads to local disturbances in the circulation resulting in either the discharge of blood or persistent manifestations in the various structures of the body. These manifestations may or may not be accompanied with a discharge of blood and affect, in the order or relation.

1, *The mammary gland* which becomes swollen, hard, and erected; the nipple browned, furnishing colostrum under pressure; with hemorrhage from the nipple or a periodic secretion of milk.

2, *The eyes, eyelids, and conjunctiva* are affected next in frequency. They become injected, present edematous alterations, photophobia, tear trickling, herpes, styes, and hyperemia of the cornea. There is increased pressure on the eyes, attacks of glaucoma, choroiditis, iritis, and neuritis optica. Especially frequent are functional disturbances such as asthenopia, photophobia, limitation of vision field, and exceptionally acute vision.

3, *The respiration* is influenced as in change in the voice, especially marked in singers, actresses, and teachers, who at the time of menstruation complain of fatigue and loss of tone. The entire voice organs may be congested, with swelling of the glands, especially distention of the blood-vessels of the posterior walls of the larynx, which is generally the cause of these phenomena. Menstrual herpes of the larynx may be observed, various disturbances of the respiration such as aphonia, nervous cough, suffocation, deep voice, vicarious hemorrhages from the lungs and premenstrual rise in temperature. The latter is an indication of tuberculosis. The nose is often the seat of trouble. Swelling of its membrane is so frequent that it has led to muscle resection and to galvanocautery operations. Bleeding from the nose is the most common form of vicarious menstruation.

4, *The organs of nutrition* manifest their association by loss of appetite, nausea, vomiting, and diarrhea. I recently had under observation a school teacher who had such obstinate nausea and vomiting for a week out of each month that she was completely incapacitated for her work. Intestinal hemorrhages are occasionally seen to supplant the menstrual flow.

5, *Disturbances of the skin* are seen in acne of the face, profuse sweating, pigmentation of the skin (chloremata uterina) pigmentation of the linea alba in young girls, herpetic eruptions, lupus, erythema, purpura, erysipelas, lichen-like papulous eruptions, and urticaria.

6, *The renal circulation* shows disturbance by bloody urine, or clayey urine from the increase of phosphates and urates and decreased secretion.

7, *Swelling of the thyroid* is frequently associated with menstruation, especially in women suffering from Basedow's disease. The arterial tension associated with menstruation may be so reduced by the loss of blood in organs with weakened vessels that it fails to cause the rupture and escape of the blood from the genital tract.

169. Amenorrhea is partial or complete suppression of the menstrual discharge in women during the usual period of sexual activity. It may be lessened gradually for a period of months, cease suddenly, or may never have appeared. It may be accompanied by a cessation of sexual desire, myxedema, or obesity. In the latter it is often difficult to determine whether the adipose is a cause or the result of the menstrual cessation. Among the chronic conditions in which amenorrhea is a symptom are long continued catarrh of the stomach; mitral defects; chronic poisoning from morphin, alcohol, and phenacetin; and the psychic diseases. Theilhaber says that half of all functional psychoses lead to amenorrhea while it is rare in the chronic psychoses.

Amenorrhea is *physiologic* when due to the occurrence of pregnancy, or during the course of lactation; *pathologic* when the result of well defined diseased conditions; and *functional* in those rare cases in which no explanation can be found in local or general conditions. The most prominent causes of the latter are psychic, as fright, an agonizing catastrophe, a conflagration, railway accident, death or news of death, marked joy or sorrow, great depression, fear of pregnancy from illicit intercourse, great desire for pregnancy, change of climate or of altitude. It may also occur from cold, getting the feet wet, cold baths or cold douches during menstruation, or from insufficient clothing. Amenorrhea is associated with chlorosis, acute and chronic anemia, obesity, and excessive loss of blood in labor or childbed. Various infectious processes frequently engender it, and it is often associated with the early stages of tuberculosis. Operative amenorrhea is induced by the removal of the ovaries during the age of sexual activity, and its manifestations have afforded much information in the study of this symptom.

Symptoms: Amenorrhea and cessation of menstruation, known as the climacteric, often resemble each other in their manifestations. The symptoms may be divided into local or remote, those emanating from the genital organs, and those from other organs of the body. The symptoms are wanting in congenital aplasia of the ovary. They are most marked when amenorrhea is the consequence of closure of some portion of the genital canal where the discharge finds no exit. The pressure symptoms thus engendered every four weeks often cause the most severe and intolerable paroxysms of abdominal pain. While the patient experiences all the discomforts of an approaching menstruation and the pain just mentioned, there is a suppression of any discharge. Generally the condition is attended later with the formation of a pelvic or abdominal tumor, the result of the accumulation. The sparse and weakened menstruation which differs but little from complete amenorrhea appears often with severe cramp-like pain in the abdomen and sacrum.

Amenorrhea is frequently associated with rapid increase of adipose. It is questioned whether the adipose is a cause or a consequence of amenorrhea. Doubtless both are due to the defective secretion from the corpora lutea. Also, as in the climacteric, the patient complains of pruritus vulvæ, colpitis, endometritis atrophicans, and irritable bladder, but more frequently of psychic nervous disturbances such as excitement, flashes of heat, increased redness, palpitation of the heart and air hunger; of hysterical manifestations such as change of voice, aversion, depression, capricious temper, the so-called reflex neuroses, migraine, nervous dyspepsia, hiccough, flatulence, insomnia, tingling and numbness of the extremities. Disturbances of the skin, of the mammary gland, and of vision may be associated with amenorrhea and disappear with the recurrence of the menses.

Where amenorrhea continues, it leads to atrophy of the uterus and ovaries and must eventually become incurable.

Prognosis. In absent uterus and congenital atrophy of the ovaries the condition is hopeless. Cases of obstruction of the genital canal afford a favorable outlook only where there is the formation of a hematocolpos. Its absence demonstrates that the ovarian function is wanting. The nonappearance of the first menstruation may be due to the delay of puberty rather than to defective development. Schaeffer found that in 10,500 cases, the first period did not occur until the twentieth year in 4.09 per cent. Cessation of menstruation from acute infectious cases which persists after convalescence would indicate that there had been destructive changes in the ovary. In the cases of increased adipose or those resulting from chlorosis, often the condition may be overcome by judicious care.

Treatment. When the organs are defective in their development, as in rudimentary and misformed, or absent uteri, or in anatomical alterations of the organs from disease such as cicatricial destruction of the endometrium or from ovarian neoplasms, treatment is hopeless. Restoration of the function is not only useless but positively injurious. An obstructive case is generally the most satisfactory, as a simple incision may be sufficient. Where atresia is high in the canal, as at the external or internal os, with narrowed or absent vagina, treatment may be very difficult and complicated. Under such circumstances with an extensive accumulation it is better to make a small incision. The sudden emptying of such a sac may lead to rupture of an adherent and distended tube.

Where amenorrhea exists in organs capable of function, the treatment should be directed: 1, to increasing the circulation in the genital organs in order to overcome defective uterine and ovarian function; and 2, to the employment of such means as will improve the general nutrition and compensate for the injuries of the amenorrhea.

1. In the former instance a sharp differentiation should be made between a functional amenorrhea and that induced by bodily disease. The production of pelvic engorgement would be contraindicated in irreparable malformations and grave constitutional conditions such as tuberculosis and diabetes. The advisability of marriage and the possibility of conception will have to be considered.

General hot baths, hot foot and sitz baths, or baths medicated with mustard, lye, carbonic acid, or the natural salts may be employed. The latter with carbonic acid come in considerable quantities in the Kissingen and Nauheim. Hot vaginal douches at 104° to 120° F. act by inducing uterine contractions. The cervix may be punctured or scarified just before the period should occur. Sounding the uterus may be employed in the virgin. The Apostoli treatment may be used by inserting the negative pole into the uterus and employing 30 to 60 milliamperes. The long continued wearing of a stem pessary had been found efficacious. Other measures are pelvic massage, Bier's treatment, and mustard plasters to the mammary glands. Internal remedies which exert an influence on the pelvic congestion are aloes, salycilic acid and its salts, salipyrin, potass permanganat, sanatori, and indigo. Apiol in nervous and hysterical patients is effective.

2. When due to constitutional conditions these should receive first consideration. Chlorosis should be treated with iron waters, especially those containing arsenic. Baths, systematic exercise, and sea-bathing are beneficial. When associated with adiposes a carefully regulated diet, gymnastics, tennis, golf, out door sports, and saline baths are indicated. The employment of the animal extracts (thyroid and lecithin) are efficacious in vasomotor disturbances.

170. Menorrhagia. An increase or prolongation of the normal flow occurring at more or less regular intervals is known as menorrhagia. When the bloody discharge seems to have no relation to the regular period it is known as *metrorrhagia*. It is very difficult to draw a line of demarcation between normal and abnormal flow. The maximum quantity that should be lost has been placed at 200 grams, but this quantity would be excessive for the debilitated woman or one who habitually loses little. It is difficult to estimate by the napkins the quantity lost for one will wear them until they are saturated, while another will allow them only to become stained. Whether the discharge is thick or the fluid clotted is of diagnostic value.

Symptoms. Profound chronic anemia indicated by paleness or sallowness of the skin, physical and mental weakness are characteristics of both menorrhagia and metrorrhagia.

Etiology. The causes of the condition are both local and constitutional. 1. Chief among the local causes is endometritis, interstitial or glandular; circumscribed mucous hyperplasia; or mucous polypi.

Menorrhagia concerns particularly the period of sexual activity and may occur soon after puberty, although the greater frequency is near the climacteric. Metritis may be associated with the endometritis although hyperplasia tends to lessen hemorrhage. Profuse menstruation in metritis may be associated with excessive copulation, masturbation, and excessive exercise at periods. The submucous and interstitial myomata often cause profuse menorrhagia while it will be absent in the subperitoneal. Periuterine inflammations either acute, subacute, or recurring, play an important rôle, but Czempin calls these secondary uterine hemorrhages. Uncomplicated ovarian tumors rarely cause increased menstruation but it may be produced by torsion of the pedicle and is observed when the cysts are malignant. Retroflexion and tubal tuberculosis are factors. Menorrhagia of a particularly obstinate character for which no cause can be assigned occurs during the sexual life. The mucosa will then be found to be atrophied. The condition has been variously ascribed to arteriosclerosis, or weakness of the muscle wall. The latter in many cases seems to be the proper explanation.

2. General conditions are chlorosis, chronic anemia, adiposis, and occasionally phthisis, although it more frequently results in amenorrhea. The acute infections such as cholera, malaria, small-pox, typhoid and scarlet fevers, and the chromic poisons as lead and alcoholic are most important. Frequent causes are diseases of special organs, as renal, cardiac, and hepatic diseases and arteriosclerosis.

Treatment. Where recognizable, treat the cause by general measures, absolute rest, saline purgatives, styptics, and the oxytocies. Ergot, hydrastin, stypticin styptol, salipyrin, ipecac, and nauseating drugs can be used. Hot vaginal douches 140°–120° F. cause uterine contractions. Tampons to promote clotting are valuable measures. The reduction of arterial tension with nitrates supplemented by tampons is sometimes efficacious. Endometritis is best treated with the curet. Myomata and persistently obstinate menorrhagia call for radical procedures. In periuterine inflammation the curet should be used only when the abdomen is to be opened at the same anesthetization.

171. Dysmenorrhea. There are few women who do not experience more or less discomfort during menstruation but when performance of the function is attended with severe often agonizing pain, the symptom is denominated dysmenorrhea. Similar pain is sometimes experienced in the intermenstrual period and has been named intermenstrual dysmenorrhea, but such employment of the term is not allowable. It is difficult to differentiate typical or essential dysmenorrhea from that which is due to diseased conditions. In the former the patient should be free from discomfort in the menstrual intervals. It is not unusual to find that after marriage a woman who when young did not suffer from dysmenorrhea has painful menstruation from gonorrheal or septic infection.

Diagnosis and Symptomatology. 1. The majority of sufferers from pelvic disease recognize the necessity for treatment while the sufferer from dysmenorrhea feels perfectly well until the advent of the period. In the interval no degree of exercise causes discomfort.

2. The colic-like appearance of the menstruation is characteristic. Following brief preliminary manifestations it reaches such a height that the patient is incapacitated for any activity. She has her legs drawn up, rolls from side to side, and complains of cramp-like pain in the abdomen radiating to the sacrum which continues for hours or recurs at trifling intervals for one or two days. The pain generally appears before the flow and frequently is associated with nausea, vomiting, and severe migraine.

3. The pain may occur with the first menstruation or come later and increase with severity. It generally affects the unmarried or nulliparous woman. The typical form not infrequently disappears after marriage thus differentiating from the pain following cohabitation and its results.

4. Special sensitiveness to sounding of the uterus is experienced at the external os and the tubal angles.

Etiology. It was formerly taught that dysmenorrhea was invariably the symptom of obstruction but every gynecologist sees cases with pinhole os or very acute anteflexion in whom menstruation occurs almost without the knowledge of the patient, and other women in whom the process is attended with agonizing pain, although the canal is so large there should be no obstruction. The hypothesis of Menge is probably the correct one. He asserts that the various kinds of dysmenorrhea have so great a similarity in character that they must necessarily be united in an essential cause. He perceives this common cause in the activity of the uterine contractions during menstruation. While the established uterine contractions which occur in every menstruation are insensible in the physically and psychically healthy woman they are recognized as labor pains in pathologically altered genitalia as well as in functional disturbances of the nervous system. In the neurotic and neurasthenic it is often a form of fatigue neurosis. Its disappearance after the birth of a child or in change of scene is due to a psychic diversion. Membranous or exfoliative dysmenorrhea is a form in which there is a more or less well formed cast of the uterus thrown off. The separation and expulsion of this material whether as a cast or in shreds in attended with agonizing pain.

Treatment. The life of the patient who suffers from this symptom must be regulated carefully. During the menstrual intervals she should be encouraged to take daily exercise in a gymnasium or in the open to harden the body and strengthen the will. During the flow she should rest in bed, have the diet restricted, wear loose clothing, retire early, and avoid every cause for nerve strain. The aim of treatment should be 1, to increase the general capacity of resistance and 2, to prevent a congested condition and promote the emptying of the overfilled vessels and spaces of the uterus. Baths and drinking of salt waters, Fl. ex. hydrastis Canadensis mm. xx–xxx should be administered three times daily in black coffee beginning eight to ten days before the expected period. This plan of treatment, regardless of the supposed cause of the dysmenorrhea is beneficial. Hydrastis Ext. cotton root ext. viburn. prunifol., stypticin, and ergot have all been found to give relief. Tr. gelsemium gtt. was advocated by Pryor. When the physician is summoned to relieve the intolerable pain morphine subcutaneously affords the quickest relief but there is serious danger of forming the habit. Cocain is objectionable for the same reason. Antipyrin hypodermically, pyramidon, salipyrin, or aspirin internally, are effective for the attack. In obstinate cases, dilatation followed by the curet, the Apostoli treatment with an intrauterine probe employing from 25 to 50 milliamperes. The hard rubber or glass drain will probably prove most serviceable. The drain should be inserted after the uterus has been dilated and cureted. It is generally advised that it be worn for a month or six weeks, but I have found no detriment from a longer retention, and have a patient in whose uterus I had to re-insert it when it came out after she had worn it for four months. For the most difficult cases and especially the membranous the establishment of the menopause by the removal of the ovaries may be the only certain measure for relief.

172. Copulation. The harmony of the marriage depends essentially on the ability of both parties to the contract to enter satisfactorily into the sexual act. For this important act in the preservation of the species and the mutual self-respect of the contracting parties no preparatory instruction is given. Unfortunately at the present day too frequently the principal aim is to gratify the sexual desire and avoid its legitimate consequences. The ultimate purpose of the sexual act is the promulgation of the species and its provisions cannot be violated without one or both parties thereto suffering from it. Over-indulgence and inability to indulge properly on the part of the male are equally prejudicial to the woman. The former, where the woman is unresponsive, means that she is a sexual slave who develops a repugnance to her mate and hatred at his approach. In the union of a lustful erotic woman to a man advanced in years, in whom the fires of youth have become feeble, whose erection is slight and ineffective, the marriage relation becomes sexual torment. Some of the causes for unhappiness in the marriage relation may be enumerated as follows: assumption on the part of the male that his desire must be gratified regardless of the inclination or want of inclination on the part of his companion—in other words that she has no control over her body that he is bound to respect; undue precipitancy on the part of the male which leads to the completion of the act before the orgasm occurs in the woman which awakens appetite without gratifying it; impotency on the part of the man which keeps the woman in a state of expectancy until she loses all hope of gratification.

Obstructions to the completion of the contract on the part of the woman may arise from malformations of the genital tract; absent or small vagina; firm, resisting hymen, rendering entrance impossible; extreme fear and nervousness; or an irritable condition of the vulva and vaginal entrance rendering the sexual act an agony. More than is usually appreciated depends on the mutual trust and confidence with which the first attempt at the sexual act is undertaken. Inconsiderate or violent efforts leave the woman sore and with a sense of outrage. Frequent and repeated intercourse while the vulva is sore and injured but adds to the agony and distress. Sympathy and consideration on the part of the man at this period is laying up a treasure which will remain in the memory of the woman during life. Pain during coition is known as *dyspareunia*. This may be transient, as the first intercourse is always painful and subsequent sensitiveness will depend on the frequency of the practice. Many of the hindrances of the relation are psychic. The fear of being unable to accomplish the act properly may render the man partially impotent. One failure causes him undue anxiety regarding future attempts. The dread of pain, the mental anxiety thus caused induces a pernicious nerve state in the woman.

173. Vaginismus is an abnormal hyperesthesia of the external genital organs which produces muscular spasm. It is common in young, nervous, or hysteric women, and occasionally occurs without our being able to discover any source of irritation. Generally, a careful examination will disclose an irritable spot in the fossa navicularis; an inflamed and thickened hymen, which has failed to rupture, or, when it has ruptured, irritable carunculæ myrtiformes; fissure in the fourchet or around the orifice of the vagina; small ulcerations within the hymen; fissure of the anus; urethral caruncle or an irritable urethra. Nervous irritation of the vulva may be engendered by association with an impotent or partly impotent man.

Symptoms. Dyspareunia, or painful coition, and sterility are the most marked symptoms. The slightest touch, or even the approach of the male, may cause powerful spasm of the sphincter vaginæ muscle. I have seen a similar spasm occur at every attempt at urination in a very hysterical woman. The suffering is so intense as to lead the patient to seek medical advice at once though through a sense of delicacy she may endure the distress until it becomes intolerable. She becomes careworn, anxious, and even hysteric. The ordinary vaginal examination is often extremely painful. I have, however, observed patients in whom the pain seemed confined to the attempts at coition. They apparently experienced no unusual discomfort during a careful pelvic investigation. Before attempting digital examination it is well to inspect the surfaces carefully when, by pushing the labia apart, possibly the cause will be discovered. Hildebrandt has described a form of vaginismus due to spasm of the levator ani muscles, known as superior vaginismus, which is responsible for that unpleasant complication, penis captivus. It must not be overlooked that dyspareunia is occasioned by pathologic lesions of the floor of the pelvis, such as prolapsed, inflamed ovaries and tubes, inflammation of the cervix, pelvic cellulitis, or peritonitis.

Prognosis as to cure is good.

In Treatment. The first essential must be the removal of the cause. When the hymen is thickened and sensitive, it may be necessary to cut it completely away. Its mucous surfaces, however, should be sutured, in order to preclude the formation of cicatricial tissue. In irritable fissure the base should be divided, as in fissure of the anus, or touched with the thermocautery. Local applications are often effective, of which one of the best is iodoform in powder or ointment. Its disagreeable odor, which often precludes its use, may be overcome by rubbing a few drops of oil of eucalyptus with each ounce of the powder. Pledgets of cotton soaked in a 4 per cent. solution of chloral or in a 2 per cent. solution of carbolic acid are useful. Ointments of opium, belladonna, or ichthyol often afford relief. Neuromata, irritable carunculæ myrtiformes, and urethral carunculæ should be snipped off. In fissure of the neck of the bladder the urethra should be overstretched and cocain filaments or pencils should be used. In obstinate spasm glass dilators or plugs (see Fig. 177) should be worn for an hour night and morning. Pain caused by the introduction of the plug soon ceases, and can be decreased by anointing it with a medicated ointment. These instruments should gradually be increased in size. When the dilator cannot be worn, recourse should be had to operation.

Injuries and lacerations of the hymen should be considered as contraindicating attempts at intercourse until they have healed.

Sims divided the superficial fibers of the sphincter vaginæ—the bulbocavernosus muscle. With the patient anesthetized, two fingers of the left hand are passed into the vagina to stretch the ostium. An incision about two inches long is made on each side of the fourchet, extending from half an inch above the ostium to the raphe of the perineum. The ostium is plugged thoroughly with gauze, which is kept in position by a **T**-bandage. This plugging is important to prevent hemorrhage. The gauze is removed the following day, after which the glass plug should be worn a portion of each day for several weeks.

For incision, forcible stretching may be substituted. This is accomplished by introducing the thumbs (Tilt) or several fingers of each hand (Hegar) and forcibly separating them until the muscular fibers yield under the traction. This procedure affords the advantage that it is bloodless and that it leaves no granulating wound to cause a cicatrix. The galvanic current has proved beneficial. Constitutional treatment always should be combined with the local measures. Quinin, arsenic, and strychnin should be given. Outdoor exercise and change of scene should be encouraged and complete sexual rest enjoined.

174. Sterility. The continuation of unguarded intercourse without fecundation, or where fecundation occurs without bringing the fruit to maturity is denominated sterility. Sterility is called *primary* when no matured ovum has occurred and *secondary* when the woman remains for years unfruitful after one birth. The conditions necessary for fruitful coition are: 1. A healthy ovum with sufficient vitality to become engrafted in a favorable soil and then develop when fecundation has occurred. 2. Healthy and vigorous spermatozoa capable of making the voyage through the uterus and tubal canal to its union with the ovum. 3. Conditions proper to favor the union or contact of the vitalizing elements either in the act of coition or when they are deposited in the vagina. 4. A healthy soil in which the fecundated seed can take root, receive proper nourishment, and, when matured, be cast off in a condition to maintain a separate existence.

1. Nature is unsparing in her provision for the transmission of life. Each ovary is supplied with many thousand ova or follicles capable of supplying them. That more of these do not become fecundated demonstrates that fortunately some defect of development exists which prevents their fecundation. Under the most favorable circumstances it is only the occasional ovum in which all conditions seem favorable and a fruitful coition results. In some individuals the number of ova capable of entering into this cooperative movement seem to be very infrequent and thus will appear but a single fruitful cohabitation. Such failure is to be expected in a woman with absent or defectively developed ovaries; or where these organs have been partially destroyed by diseased processes subsequent to puberty. The healthy fecundated ovum has a potential force which enables it to fasten upon and receive nourishment from any favorable soil with which it may come in contact. This favorable soil is generally recognized to be a surface lined with cylindrical epithelium. Thus the germinated ovum finds its most favorable resting place in the uterus. Occasionally it has the misfortune to become arrested and subsequently develop in the same portion of the tube. It grows rarely in the ovary and with the greatest rareness on the peritoneum.

2. The researches of the physiologists have demonstrated that a number of chromosomes are furnished by the female in the ovum and an equal number come from the male in the spermatozoid and the union of these results in fecundation and the promulgation of vital forces which result in a new being. It is evident then that for fruitful coition the spermatic fluid of the male must contain well-developed spermatozoids, which, when united with the ovum will furnish the necessary vitalizing impulse. Failure to secure fruit after prolonged continuation of the marital relation then should not be ascribed only to the woman. Careful investigation of her organs failing to reveal any mechanical cause for the failure, repeated microscopical investigations of the recently discharged semen should be made to make sure that it contains the necessary spermatozoids of sufficient vigor and vitality to render them effective agents. The woman should not be subjected to operative measures for sterility, unless palpable conditions otherwise demand it, until the suggested investigation of the male fluid has been made. The investigations of Kohner, Fabringer, and other have rendered it probable that in from one-fourth to one-third the unfruitful cases the man is responsible. The attempted cohabitation may be ineffectual from inability to deliver the fluid into the vagina as in hypospadias, defective development, or from psychic impotency. The mere fact of potentiality, however, should not be accepted as evidence of ability to procreate without the microscopic investigation, for from the baneful influence of gonorrheal infection, orchitic changes may result so that a condition of aspermatism exists. Considering these conditions it will not be far out of the way to ascribe one-third to one-half of the unfruitful marriages to the man. Some

place this responsibility at 70 per cent. If we add the inability on the part of the man to the results of infection he has conveyed to the woman this percentage is more than justified.

3. It was formerly considered that in the act of coition the penis of the male was in union with the uterus and the spermatic fluid was practically injected into that organ. The orgasm which in the male results in the discharge of the spermatic fluid, in the woman squeezes out of the cervix a small plug of viscid secretion which, when drawn back, draws with it the spermatozoa or affords a favorable material for their progress. This alkaline secretion favors their activity while the acid secretion of the vagina is inhibitory. An elongated cervix, a small cervical canal free of secretion, a retroverted uterus, a deep retrouterine fornix or one so shallow that the semen is not retained, a tortuous or obstructed cervical canal from acute anteflexion are barriers which assist in rendering fecundation difficult. Inflammatory changes in the uterus and especially the tubes are still more effectual barriers. If complete these may restrict the entrance of an ovum so that the possibility of vitalization is effectually prevented. Oöphoritis and perioöphoritis are also factors in the exclusion of possibilities of fecundation. Neoplasms may obstruct some portions of the genital tract of the woman. While the deposit within the genital organs of the woman of semen possessing vigorous well-developed spermatozoa is regarded as essential to conception, it should not be overlooked that occasionally a vigorous spermatozoid cast away on the inhospitable shores of the vulva may brave the hostile acid secretions of the vagina and, revived, after reaching the invigorating fluids of the uterus, undaunted by the opposition of the cilia, or its absence, in portions of the tube, may stem its course through a narrowed and tortuous canal until it finally reaches its goal—its other half, the ovum. With their union fecundation is accomplished. The healthy semen contains many of these organisms while but one slightly introduced is sufficient.

4. We have seen that the fecundated ovum had the ability to fasten itself on a favorable soil, imbed itself, and obtain therefrom the nutrition necessary for its existence and growth. Changes in the endometrium which render it unfit to receive the ovum by the formation of a decidual membrane necessarily prevents its attachment, or later when attachment occurs, favors the consequent abortion. Long continued inflammation not only produces unfavorable conditions in the endometrium, but results in metritis which leads to substitution of fibroids for muscular tissue by which the expansive power and consequently the ability to accommodate the development of the ovum is limited. Inflammatory alterations of the tube may be of such a character that while admitting the entrance of the fecundated ovum into the tube, they so limit or obstruct its progress that the pregnancy becomes an ectopic one with all its attendant dangers.

Diagnosis. The recognition of sterility is rendered difficult by inability to comprehend all the factors which may cause it. An unfruitful marriage may result from efforts to prevent conception. These employed for a length of time may produce such changes as seem to render the individual immune to its occurrence. It is not an unusual occurrence after years of unfruitful wedlock for women who doubt their ability to bear children to become pregnant, and the spell once broken to bear several in succession. The diagnosis of sterility seems justified when the couple who desire children are unfruitful after three years of wedded life. Absent or defective genital organs are rendered evident by the absence of menstruation and the physical examination of the patient. Absence of menstruation in the presence of good health is a frequent indication of want of development or degenerative changes. Failure of menstruation for a number of years, however, should not be considered as affording an absolutely unfavorable prognosis as the following brief history would indicate. Some years since I assisted Prof. Keen of Philadelphia in an operation on a woman thirty years of age who had not menstruated for eight years and had been married three years without pregnancy. The left ovary, the size of a walnut, was removed and the advisability of the removal of the other which contained small cysts considered. As they were not large I suggested puncturing them with a cautery and retaining the ovary. A number of punctures were made and a few months subsequent to her operation she began to menstruate and shortly thereafter became pregnant. She subsequently gave birth to three children. Sterility as a result of inflammation can be inferred from a history of pelvic attack and the recognition by pelvic examination of the fixation of the uterus or the appendages. The failure after careful investigation to discover any condition which should cause sterility in the woman should lead to a careful and repeated investigation of the fresh semen from the husband. The woman should not be subjected to an operation unless indicated for other causes than the sterility without the careful investigation of the husband's possibilities.

Treatment should consist of regulation of the nutrition, the employment of measures to improve the general health, change of scene, sea air, sea bathing, and especially a sea voyage, infrequent sexual indulgence. The potentiality of the man and the susceptibility of the woman are often favored by sexual rest. Dilatation of the uterus, absorption of inflammatory exudates, correction of malpositions are therapeutic measures. In susceptibility to abortion—especially where it is the result of syphilitic infection potassium iodid is the most effective agent. Its influence in overcoming the tendency to habitual abortion is quite as effectual in the nonsyphilitic as in the syphilitic disease of the endometrium.

MALFORMATIONS.

175. **Definition and Classification.** A genital malformation is any deviation from the normal form and structure of the reproductive organs. As the processes of development are not complete before puberty, such deviations may arise from the arrest of growth, or its distortion, at any time previous to it. The great majority of abnormalities are due to prenatal causes and therefore are congenital.

176. Bifidities. The origin of the uterus and vagina in the coalescence of the two Müllerian ducts naturally results in their more or less complete separation into two canals when the continuation of the process of growth is faulty or arrested. The bifid development may be either equal, or unequal; may result in the formation of two canals by a simple partition or septum through what appears to be one body; or a partial or complete separation in two bodies.

177. The Degrees of Division. The most frequent malformation is a more or less complete septum forming two canals between the uterus and vagina. According to its extent, this may consist of five degrees. The first degree (I, Fig. 165) will present the mere outline of a partition which projects from the fundus. Such a condition rarely is recognized during life, unless opportunity is afforded for digital exploration of the uterine cavity. In the *second degree* (II, Fig. 165) a septum extends through the body to the internal os. This form can be recognized following delivery or abortion, but otherwise may give no indication of its presence. Such a septum may be destroyed by a pregnancy. In the *third degree* (III, Fig. 165) the body and cervix are divided by the septum into two distinct canals. The *fourth degree* (IV, Fig. 165) affords a septum which is incomplete in the lower half of the vagina, and the *fifth degree* (V, Fig. 165 and 173) presents a complete uterovaginal septum, forming two canals. One of these canals may be overlooked readily, or coition may occur in either side, indifferently.

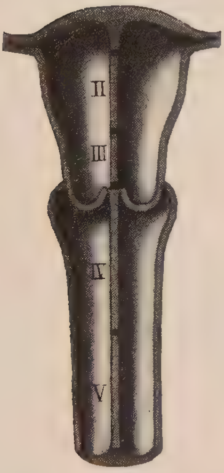


FIG. 165.—Degrees of Division of the Genital Tract.

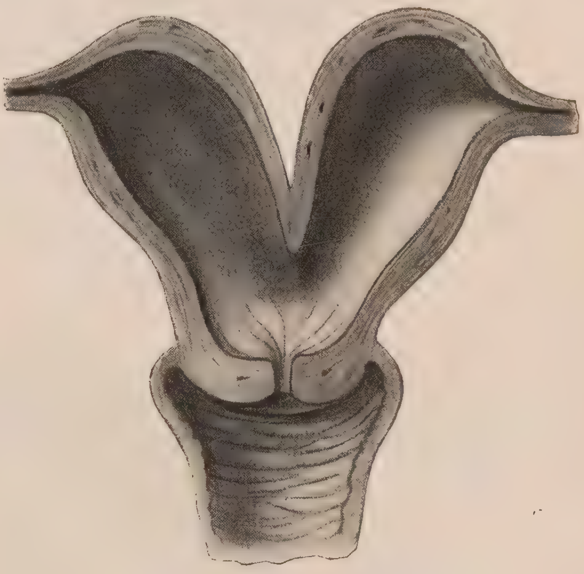


FIG. 166.—Uterus Bicornis.

178. Double Uterus. The division of the uterus into two portions may be partial or complete, and consequently forms three classes:

First, the division of the fundus by a groove and two lobes, known as the uterus bilobularis, uterus bicornis arcuatus, or uterus bicornis unicollis (Fig. 167), the latter especially when but one cervical canal exists.

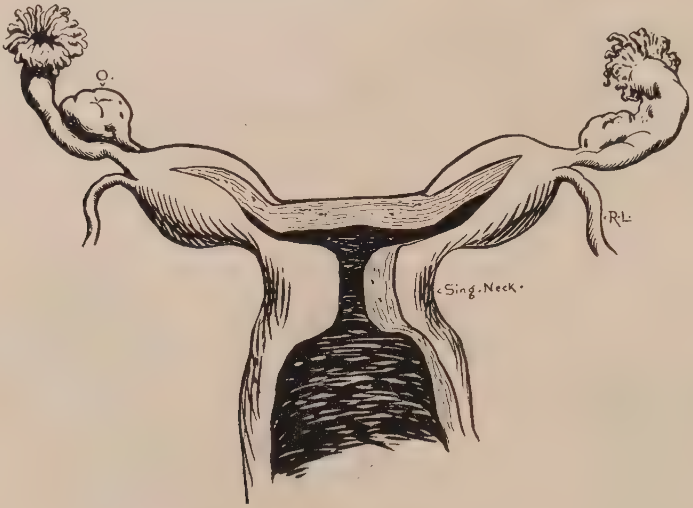


FIG. 167.—Uterus Bicornis Unicollis.

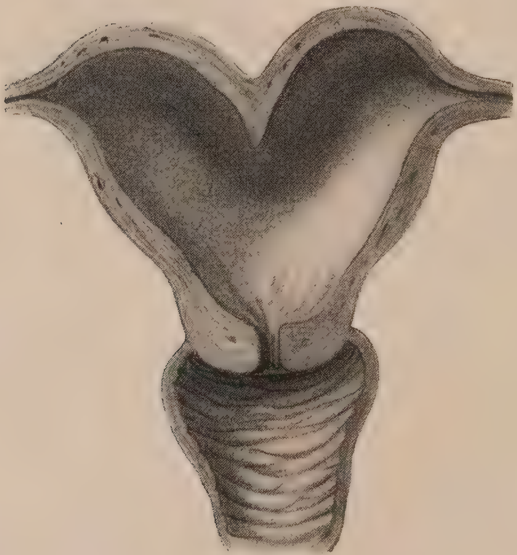


FIG. 168.—Uterus Bifidus.

Second, the body divided into two distinct portions, the double uterus bicornis (Barnes)—uterus bifidus; it may have a single or two cervical canals. (Fig. 168.)

Third, two separate organs exist, each with one tube and ovary, uterus didelphys. (Fig. 169.) The bodies diverge, each half being held to its corresponding side by the short broad ligament.

179. Unequal Development of the Two Sides. The two canals of Müller may be incompletely developed and thus produce asymmetric organs of varying form. One canal may be completely atrophied, while the other presents a well-developed horn—the uterus unicornis. (Fig. 170.) Generally, the absence of one horn is associated with absence of the corresponding tube and ovary. The horn may be rudimentary or partly developed, permitting the occurrence of menstruation and even pregnancy. Such a horn generally is not prepared to continue to maintain the fecundated ovum to the completion of gestation, and may cause

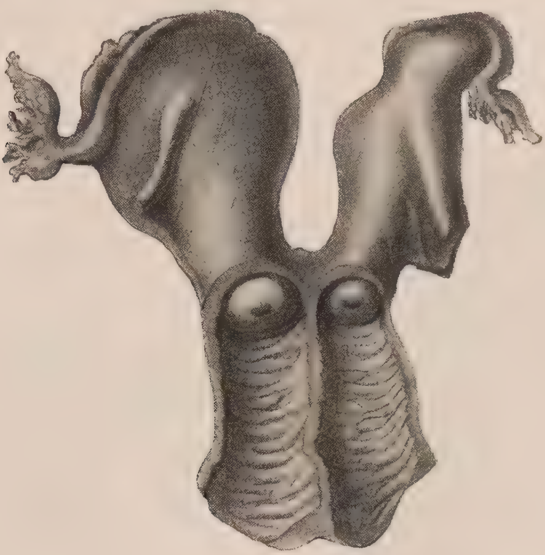


FIG. 169.—Uterus Didelphys.

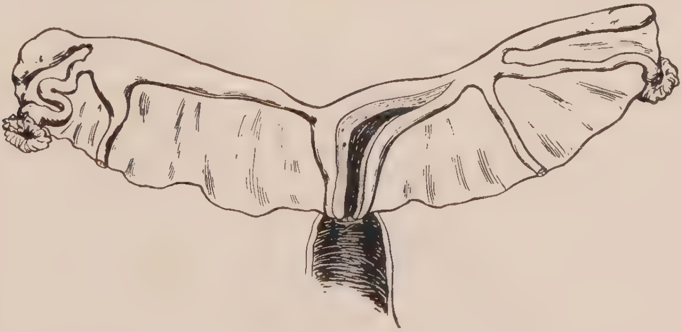


FIG. 170.—Uterus Unicornis.

rupture prior to the sixth month. Not infrequently the occurrence of such a pregnancy is quite as dangerous to life as a tubal gestation, from which it cannot always be differentiated prior to operation. I have seen a one-horned uterus which had passed successfully through more than one pregnancy and the abnormal condition was only discovered by accident. *Atresia* may exist in the canal of a rudimentary or partly developed horn and lead to an accumulation of the menstrual secretion and the formation of a tumor. (Fig. 171.) Diagnosis is extremely difficult and may be determined only by operative procedure. The accumulation may rupture into the vagina, but usually at such a height as to leave a portion of the sac dependent and undrained, likely, therefore, to become infected and cause septicemia. When recognized, treatment should be that for retained menstruation, to be described later. The development of a one-horned uterus may be associated with a double cervical canal—*uterus biforis*—a condition which may cause embarrassment during labor. The septum when discovered may be pushed to one side, or, if necessary, be cut between two sutures (Pozzi). When torn, it has caused severe hemorrhage.

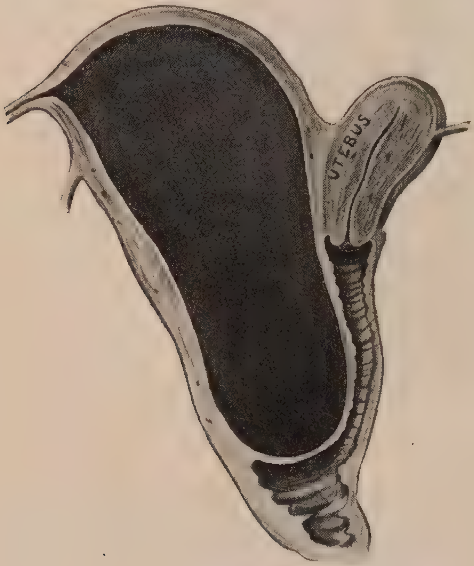


FIG. 171.—Atresia of Rudimentary Horn with an Accumulation of Menstrual Blood.

180. Absent Uterus. Entire absence of the uterus is rare, and almost always is associated with absence of the other genital organs, particularly the vagina. The determination of the condition is difficult.

The introduction of the index-finger of one hand into the rectum and that of the other, or of a catheter into the bladder enables the operator to explore the pelvis thoroughly. Failure to recognize the organ may be due to its rudimentary condition or its displacement to one side, and we can assert its entire absence only when we have been able to explore the pelvis through an abdominal incision or during an autopsy.

181. A rudimentary uterus may exist in the form of a slight thickening over the surface of the bladder, as two undeveloped canals in the form of a **T**—the *uterus bipartitus.* (Fig. 172.) The vagina is frequently absent or may be partly developed, deepened by coition, or may exist as a small culdesac continuous with the urethra, which has been dilated by repeated efforts at coition. Menstruation is generally absent; ovulation may occur without molimina, or there may be the occurrence of hematometra.

When the vagina is well developed and menstruation occurs, the condition may remain undiscovered. The rudimentary character of the organ can be determined by bimanual palpation or by palpation through the rectum and the bladder, as has been described. The occurrence of painful molimina may require castration.

182. **In fetal and infantile uteri** from arrest during the fifth stage of development the uterus is small, the cervix two or three times the length of the body, and an acute anteflexion of the body probably exists.

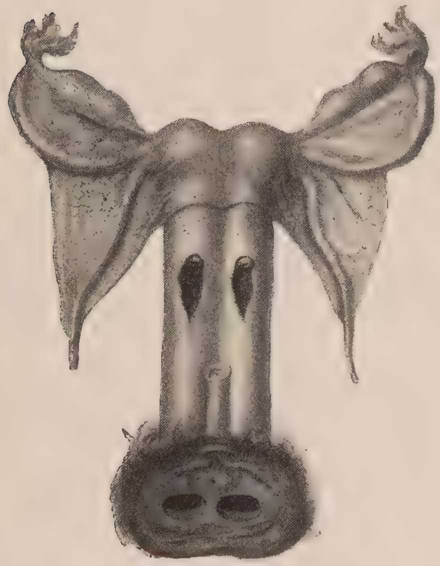


FIG. 172.—Uterus Bipartitus or Duplex.

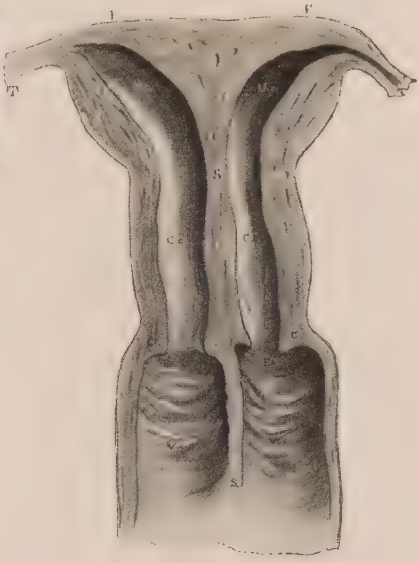


FIG. 173,—Uterus Biseptus.

The infantile uterus differs from the fetal in the arbor vitæ arrangement of the mucous membrane which no longer extends to the fundus. Menstruation rarely occurs, and sexual desire is generally absent. The external genitals may be poorly or well developed. The breasts not infrequently are normal.

183. **Treatment of Uterine Malformations.** A malformed uterus is one imperfectly developed, in which the functions must be performed feebly. A septum through the uterus and vagina may cause dyspareunia by the diminished size of the vagina. It need not produce distress nor danger during gestation, but not infrequently the cervical and vaginal septa are a cause of dystocia.

A vaginal septum should be cut through its entire length and the edges of each wall sutured to prevent readhesion. Its division by the thermocautery has been advocated to save the time given to suturing. The cervical septum can be crushed by forceps, which should be left in place to produce necrosis of the compressed tissues. These septa do not generally survive the first gestation, but are broken down during the labor. I have several times seen a bridle of tissue attached to the lower portions of the anterior and posterior vaginal walls, which were, without doubt, remnants of an originally more complete septum.

The division of the uterus into two equally developed portions does not usually call for treatment as pregnancy has frequently occurred without appearing to produce difficulty in parturition.

A patient upon whom hysterectomy was done for interstitial myomata had previously given birth to two children, apparently without any unusual phenomena. The operation disclosed upon one side a rudimentary horn which had its cervical canal, opened into a blind pouch for a vagina, and was situated between the existing vagina and the bladder.

The adjoining cornua of a partially bifid uterus may be split and trimmed and their edges sutured to form one cavity. It may be questioned how such a reconstructed organ will endure the course of a gestation, but if pregnancy can go to full term in one horn of a uterus such an organ should be more capable of performing its physiologic functions. Where the uterine cornua are unequally developed, there is danger from conception in the rudimentary cornu. The recognition of the existence of such a pregnancy should be considered ample justification for its extirpation. Where both cornua are rudimentary and the patient suffers from menstrual molimina, the abdomen should be opened and the ovaries removed. Similar procedure is proper when the uterus is absent.

Fetal and infantile uteri frequently present conditions in which the function of menstruation is performed irregularly and attended with severe pain. The probability of the patient becoming pregnant and carrying the fetus to full term is dependent upon the degree of development. Under the stimulation of the marital relation such uteri occasionally increase in size. More frequently the individual complains of irregular and painful menstruation and is sterile.

184. Absent or Rudimentary Tubes. Absence of the Fallopian tubes is rare, and occurs with a similar absence of the ovaries and uterus. One tube is more frequently absent and a unicornate uterus accompanies it. A rudimentary tube results generally from an attack of fetal peritonitis. The tube may be a simple cord and yet have fully developed fimbria. The fimbria may be independent of the openings. Additional ostia are frequent. Ferraresi found six openings upon one tube, all of which were surrounded by fimbria. While generally at the end, these openings may occur in the middle of the duct, and are probably due to failure in closure of the groove in the germinal epithelium or to splitting of the Müllerian duct after it has closed.

The normal tube is 10 to 12 cm. long; in ovarian or broad ligament cysts and in ovarian hernia a tube may be 16 to 18 cm. long.

185. Absence of ovaries is exceedingly rare. The abdominal cavity must be inspected to confirm the suspicion. Absence of one is less rare, is associated with a unicornate uterus, and occasionally with absence of the corresponding kidney. The rudimentary ovary is more frequent and may be fetal or adult. It may contain no glandular tissue, or the presence of unclosed Pflüger's tubes may indicate the existence of a testicle. The condition may be produced by oöphoritis or peritonitis during fetal or adult life, or by the twisting of a pedicle.

186. **Extra ovaries** are very rare. Von Winckel found a third ovary in front of the uterus. Tufts of ovarian stroma have been described. The occurrence of menstruation—even pregnancy—after the supposed removal of both ovaries has been reported, but it is more probable that in all such cases there was failure to remove the entire structure of both glands.

187. **Accessory or constricted ovaries** are more frequent. A portion of the ovary may hang from the main body by a more or less well-marked pedicle. Two or three have been found associated with one ovary.

The ovary may descend and be situated at, or below, the brim of the pelvis. An ovary in a hernial sac is often difficult to recognize, and productive of serious distress.

188. **Round and Broad Ligaments.** Absence of the round ligament is generally associated with defects of the uterus. The muscular structure of the round ligament was completely absent in one of my patients. The broad ligament fold in which the round ligament would lie was a thin corrugated margin. The persistence of the canal of Nuck permits the formation of a hydrocele, which may become quite large in the labia majora. The broad ligaments may be absent, extremely short, or unequal in length and thickness. They often contain cysts which are relics of the parovarium.

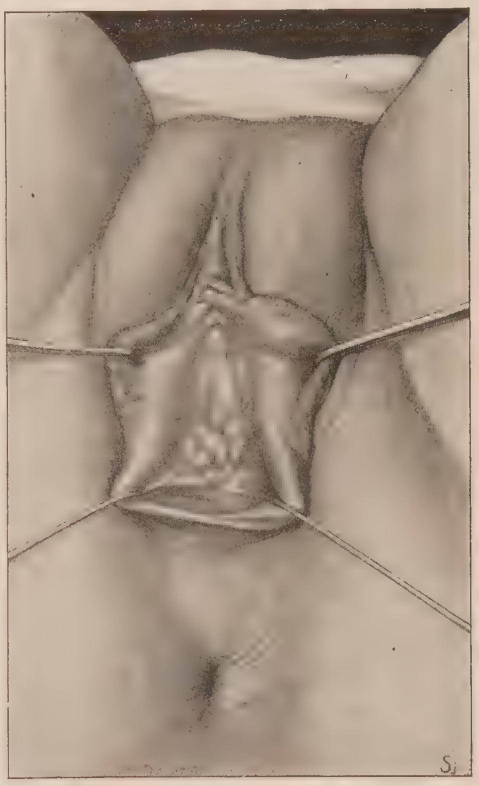


FIG. 174.—Absent Vagina.

189. **Absent or Rudimentary Vagina.** When the vagina is absent, no trace of its tissue will be found between the rectum and bladder. These two organs are separated by connective tissue only. (Fig. 174.) The rudimentary vagina may exist as a fibrous cord, indicating the site of the ducts of Müller, whose development has been arrested early in fetal life. One of the segments of the vaginal canal may be absent with

an incomplete development of the other. The uterus, also, may be absent; reduced to a rudimentary nodule; or more or less defective in its development. Rarely is a well developed uterus found in absence of the vagina. Normal ovaries are scarcely ever present without manifestation of menstrual molimina although the only manifestation may be periodic pains during ovulation. Vicarious hemorrhage from different portions of the body with extreme pains have been reported as occurring at the supposed menstrual periods when a well formed uterus existed. While the vulva also may be absent, it is more frequently well formed, presenting a funnel-shaped depression behind well developed nymphæ. The hymen may be perfectly normal, while the urethra is at times dilated by the efforts made at coition. It is difficult to determine why the lower portion of the vagina should be present most frequently in cases of arrest in development. It is probably because of an abnormal elongation of the vestibular canal. This pouch, in the absence of the vagina and uterus has been found 2 or 3 cm. in length and sufficiently wide to admit the finger. These dimensions are considerably increased by sexual efforts. The opening is generally closed by a pearly reticulated membrane, apparently cicatricial. The central portion of the vagina may be absent, or replaced by a membrance of variable thickness which is at times perforated. I saw one patient in whom the upper and lower halves of the vagina were divided by a membrane which had a small opening at one side through which the menstrual discharge escaped. This membrane was incised and a good sized cavity was opened. A serviceable vagina was formed by removing a section of the septum and suturing the raw surfaces. When the vagina is absent, the condition should be determined by a finger in the rectum and a catheter or a sound in the bladder. Combined rectal and vesical touch permits the recognition of the uterus and its degree of development.

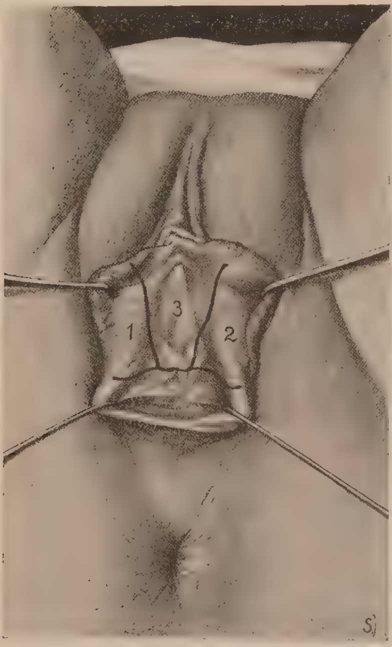


FIG. 175.—Line of Incision for Formation of Flaps.
1, 2, 3. Flaps from labia minora which are split and used to line the vagina.

Treatment. When the vagina is wholly or partially absent, different methods of treatment are demanded according to the development of the uterus. If the latter is normal and symptoms of menstrual molimina have occurred, or if the uterus has increased in size, hematometra should be suspected and interference is indicated. Absent uterus with well developed ovaries causing recurring pain requires castration. Absent vagina makes the woman sexually incompetent and brings up the question whether a vagina shall be constructed for sexual purposes. Amussat first performed the operation to construct a vagina. An incision is made through the vulvar surface separating the bladder from the rectum by blunt dissection until a depth of 6 to 8 cm. has been reached or the peritoneum opened. The second steps of the operation consist in the investment of the opening with integument to prevent cicatricial contraction. The adjacent skin and mucous membrane may be employed. When the labia minora exist they can be split and utilized for lining the anterior portion of the canal, while flaps can be taken from the vulva and inner side of the thighs to cover the posterior wall. (Figs. 175 and 176.) After the flaps are secured by sutures the cavity is packed with iodoform gauze which is retained, or renewed, until cicatrization is complete, after which the canal can be kept open by a glass plug. The opening has been maintained by the glass plug (Fig. 177) without lining the canal. Because of the cicatricial contraction, however, it is exceedingly difficult to keep such a canal open, even though an obturator be constantly worn. The lining of such a canal has been secured by utilizing the redundant vagina from another patient. The tissue should be sutured over a glass plug (Fig. 177), or, preferably, over the end of a slightly distended bivalve speculum, after which it is introduced into the canal, and, as the speculum is withdrawn, the cavity packed lightly with iodoform gauze. While awaiting the preparation of the vaginal lining the cavity should be packed with gauze temporarily, and the packing introduced within the hood should be removed at the end of a week. If the tissues have united by this time, it should be irrigated, removing any tissue that has not retained its vitality.

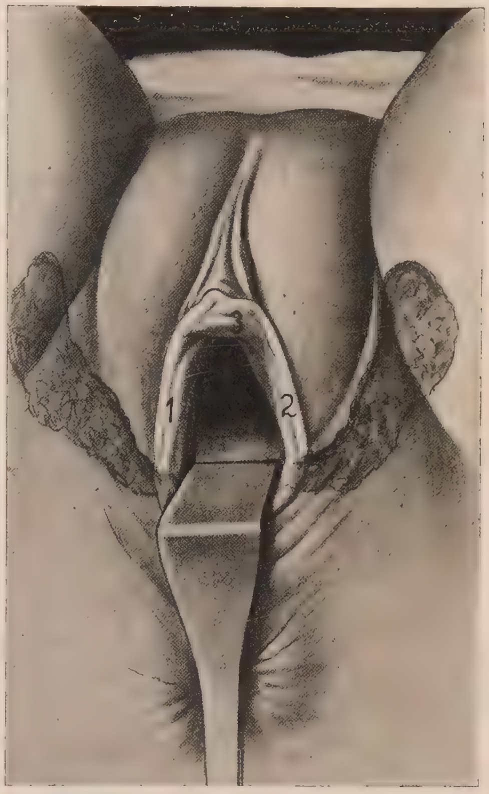


Fig. 176.- Flaps outlined in Fig. 175 Sutured in Place, and Denuded Surfaces which Have Furnished Flaps to line Posterior wall.

In the patient represented by Figs. 175 and 176, after forming the wall of the anterior portion by splitting the labia minora, a flap was transplanted from the posterior part of each thigh. Fortunately this became attached and a satisfactory vagina was formed.

In making the dissection for the vagina, the operator should not hesitate to open through the peritoneum. Such an opening permits the presence and size of a rudimentary uterus to be determined more readily, and the cervix affords a safe point for the fixation of flaps to line the constructed vagina. I do not doubt that the employment of a portion of the sigmoid or ileum, as advocated by Baldwin, of Ohio, will prove the most efficient vagina. Such a procedure necessarily requires an abdominal incision, as the cul-desac of the bowel must be restored by anastomosis throwing out the loop utilized for the vagina.

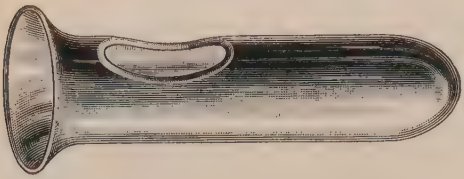


FIG. 177.—Sims' Glass Dilator.

190. Double Vagina. The septum may divide the entire vagina. (Fig. 178.) The uterus, also, will be double or divided. Occasionally, the septum in the uterus does not extend through the external os, while that of the vagina terminates below it. The hymen may have two openings, simulating double vagina. Coition generally occurs through the larger of the two conduits; occasionally it may occur in either one. When the vaginal partition is partial, the upper portion of the septum will be lacking. When the uterus is double, the upper portion of the vagina often is found to contain the septum, while fusion has been complete below. The septum is usually thick and fleshy, resembling the rectovaginal partition, or it may be very thin, and even perforated in places. Partition of the vagina is not incompatible with normal labor. Dunning has reported cases in which the two vaginæ were separated by a septum that began just above the vulva and extended to the interval between the two small cervices. The separation of the uterus into two parts was demonstrated by the use of the sound. Pregnancy occurred upon the right side and, as the uterus enlarged, the septum disappeared. During labor the vaginal portion was torn from top to bottom and only the lower portion persisted. An incomplete septum may form an obstacle to the passage of the child's head. When it does so, it should be incised. I have seen several patients who had a vaginal septum destroyed in labor previously, and there remained a bridle extending from the anterior wall of the vagina back to its posterior commissure, which hung below the vulva. Twice have I cut through a septum the entire length of the vagina and sutured the surfaces on each wall, so that a single canal was formed. This course I considered wise as it decreases the discomfort during coition and removes a cause of dystocia in the event of pregnancy.

Arrest of development in one of the ducts results in a unilateral vagina. It is not uncommon in double vagina to find incomplete development in one of the ducts.

191. Atresia of the genital canal is either congenital or acquired. The latter will be discussed later. Congenital atresia may affect any portion of the canal, but is more likely to occur within the vagina or near its orifice at the junction of the vagina and vestibular canal. Next in frequency is the atresia of the internal or external orifices of the cervical canal, although the congenital closure of these orifices is comparatively not nearly so frequent as the acquired. Vulvar atresia is not uncommon. It is produced by imperforation of the hymen or agglutination of the labia minora or majora. In the latter there is usually an orifice in front through which the urine and menstrual flow can escape. Such conditions are often unrecognized until after the establishment of puberty, when the occurrence of periodic distress in the pelvis, colic-like pains, sensation of weakness, bearing down, and irritability of temper indicate an effort to establish the menstrual flow. The continuance without discharge and later the development of a tumor in the median line should awaken the suspicion of the attendant to the possibility of obstruction to the menstrual discharge and of its accumulation within the genital canal. The mere inspection of the parts discloses the imperforation of the hymen. (Fig. 179.) A tumor will protrude from the vulva; there is difficulty or abnormal frequency in micturition, more or less obstruction in evacu-

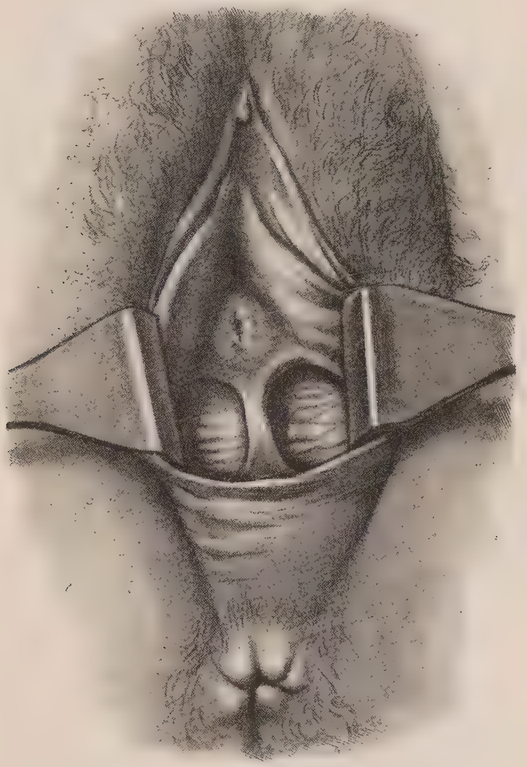


FIG. 178.—Double Vagina. (*Photograph taken from patient of Dr. J. M. Fisher.*)

ating the bowels is experienced, and a smooth, purplish surface is seen at the vulvar orifice. If the obstruction is situated in the vaginal canal, the vulvar protrusion will not be so marked. The introduction of the finger into the canal, however, discloses the accumulation. It is more definitely determined by the finger in the rectum, when the globular tumor encroaching upon that organ is recognized. Pressure over the abdomen causes a sensation of elasticity or indistinct fluctuation. When the vagina is absent, the accumulation forms in the upper part of the vaginal canal or within the uterine cavity. An accumulation in the vagina is known as a hematocolpos in the uterus, as a hematometra; in the Fallopian tube, as a hematosalpinx; in both uterus and vagina, as a hematocolpometra; and when the distention also involves the tube, it becomes a hematocolpometrasalpinx.

The symptoms are absent menstruation, although the patient experiences each month discomfort, a sense of fulness or engorgement in the pelvis, with the usual nervous manifestations which awaken the anticipation that menstruation is about to make its appearance. A symmetrical enlargement of the lower abdomen appears, which from its contour has been mistaken by the careless observer for pregnancy. The history of the case, with a careful physical examination of the patient, should establish the diagnosis. When the obstruction occurs at the internal os with a normal cervix and roomy vagina, the diagnosis becomes more difficult. The mere fact that a girl has never menstruated does not exclude the possibility of pregnancy. In the latter will be found mammary changes, an enlarged and softened cervix, increased vaginal secretion, swelling, and a dusky appearance of the vagina and vulva. In the accumulation of blood these symptoms are absent and the cervix remains small, rather firm, and hard. As the accumulation increases the cervix becomes softened, and the uterus thinner, forming a thin-walled sac which affords distinct fluctuation.

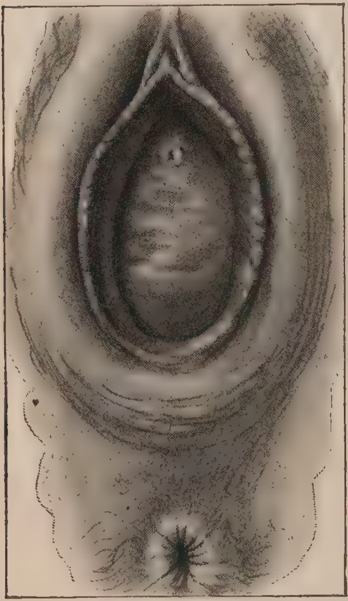


FIG. 179.—Imperforate Hymen.

Treatment. Operators were formerly very much averse to evacuating the fluid of such a collection. The fluid is thick, chocolate colored, and quite slimy, due, of course, to the retention of the blood and mucous secretions of the canal. It formerly was advised that a small pinhole orifice should be made through the opening in the hymen, to allow the discharge to continue slowly for several days. Such a procedure resulted in infection and produced an inflammatory condition of the genital canal which not infrequently caused the death of the patient. The enormous distention of the tissues renders them extremely anemic, and the removal of the pressure permits an engorgment, which can readily result in inflammation. The most satisfactory method of treatment consists in a free incision to evacuate the contents of the cavity; removal of the stringy mucus with the finger, and then thorough irrigation with a weak antiseptic solution, such as a two per cent. sodium bicarbonate, three per cent. sodium chlorid, bichlorid of mercury (1:4000), or formalin

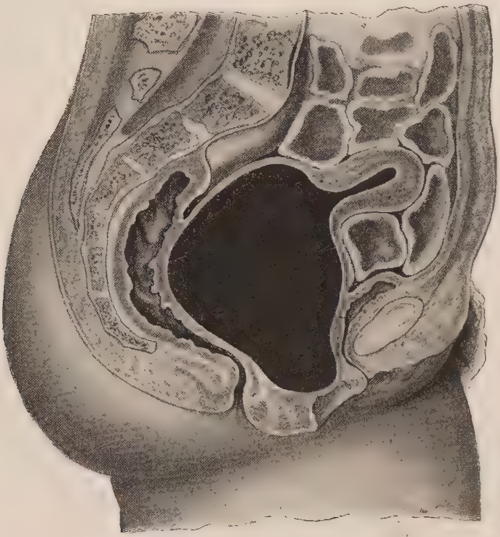


Fig. 180.—Hematocolpos.

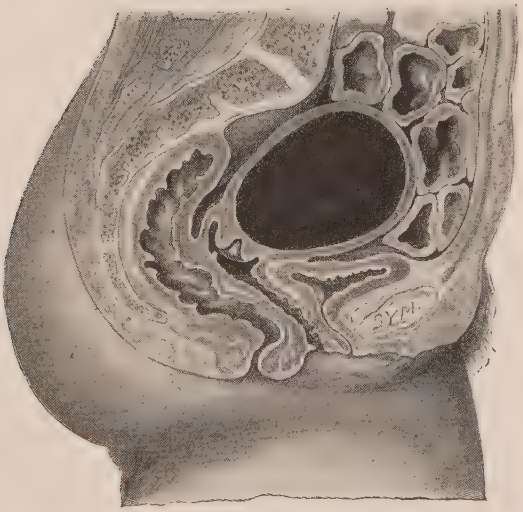


Fig. 181.—Hematometra.

(1:1500). A large quantity of the solution should be employed; the irrigation to be followed, when of the two latter solutions, by a douche of normal salt solution. Finally, when the quantity of fluid evacuated is large, the cavity should be lightly packed with iodoform gauze to afford moderate pressure upon the surface, to prevent engorgement, and to give the structures something upon which to contract. When the accumulation occurs above an obliterated or absent vagina, a trocar can be employed to reach the fluid, guided through the intervening structures with a finger in the rectum. The opening made by the trocar is then enlarged to permit a free evacuation, and the treatment already advised should be employed. When the accumulation occurs in the uterus from obliteration of the external os, often it will be difficult to determine the site of the latter. The cervix should be exposed, and if we cannot determine the situation of the former os, a puncture should be made with the trocar. This opening should be enlarged subsequently in order to permit the evacuation of the uterine contents. The cavity is then irrigated and packed with gauze. If the obliteration has developed at the internal os, the remaining cervical canal affords a passage through which the puncture can be made safely. The canal having been dilated and the cavity thoroughly irrigated, the latter should be lightly packed with gauze.

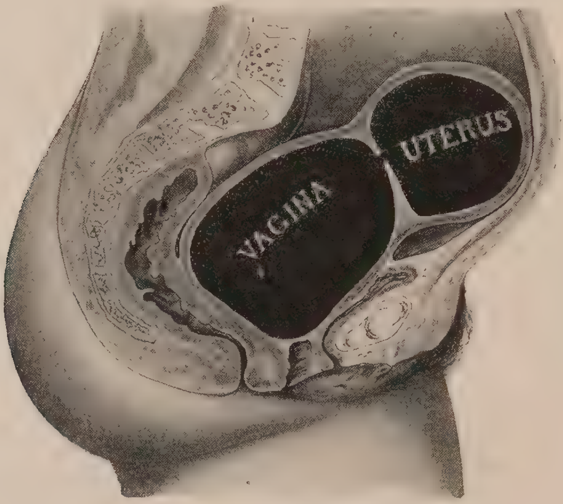


FIG. 182.—Hematocolpometra.

In all cases in which the obstruction is found in the uterine or cervical wall, measures should be instituted to secure subsequently a patulous canal, otherwise the obstruction will be reproduced. The better plan of procedure will be to suture the internal and external surfaces of the uterine opening.

The one element of danger in these operations occurs when the Fallopian tube is distended with an accumulation and is fixed by extensive adhesions. The dragging upon the thin tube which follows the contraction of the empty uterus may cause its rupture and the escape of its contents into the peritoneal cavity. Extreme care should be exercised in a hematosalpinx not to make much pressure upon the abdominal surface while the sac is being emptied. Whenever the sac has disappeared with insufficient discharge from the uterus, or when it has disappeared before the opening into the collection has occurred, an immediate abdominal incision should be made to cleanse the peritoneum and remove the offending sac.

Where the organs are divided by a septum, atresia may take place in one-half of a divided vagina or uterus. A lateral tumor will project into the vaginal canal, which will be so elastic and obscure as to render doubtful the fact whether it is a pelvic cyst or a lateral hematocolpos. Such cases are less dangerous than atresia of the entire vagina, as the accumulation will probably rupture into, and discharge through, the existing vagina. The opening, however, will be high, permitting serious symptoms from infection and the development of a pyocolpos. It is generally advised to make a free incision and pack such a cavity with iodoform gauze, but I much prefer to excise a large section of the wall and unite the mucous surfaces of its cut edges so that the two chambers become one. When the atresia has occurred in one half of the uterus, the diagnosis is difficult. It is not always situated to one side of the developed horn, but may curve about it. The accumulation may then be accessible through the vagina, or may be exceedingly difficult to reach. When accessible it should be opened through the vagina. When inaccessible below, the tumor should be removed by an abdominal incision, as for pyosalpinx.

192. **Defects of the vulva** are generally associated with a similar condition of the vagina and uterus, although such a defect may exist with a normal development of the other genital organs. It then probably results from coalescence of the labia majora. The latter are generally absent in exstrophy of the bladder, and may also be found so in other malformations. The nymphæ can be absent and the clitoris so imperfectly developed that the site of the vulva presents a mere slit or flattened surface, upon which the urethral orifice opens.

Infantile vulva occurs in weak, sickly women, who have suffered from prolonged ill health prior to puberty, and is generally associated with an imperfect development of the uterus and tubes. The mons veneris and labia majora will be bereft of, or sparsely covered with, hair.

193. **Defects in Nymphæ.** Absence of nymphæ is infrequent, and is accompanied by incomplete development of the clitoris. More frequently they are thin, flabby, elongated, and pointed. Occasionally they are perforated by small openings. *Hypertrophy* of the nymphæ is much more frequent. The nymphæ project beyond the labia majora; in the bushwomen of Africa they form large folds, which reach nearly to the knees, and are known as the Hottentot apron.

194. **Defects of the Clitoris.** The clitoris may be so enormously developed as to cause the sex of the individual to be questioned. In exstrophy of the bladder and absence of the symphysis it may be bifid

or rudimentary. It is rarely absent. Frequently, from congenital conditions or from neglect of cleanliness, the smegma is retained beneath the prepuce, producing such irritation and adhesions that the glans clitoris is compressed and prevented from attaining its normal size. The adhesions become so firm as to render their separation difficult. The existence of adhesions and the retention of smegma are capable of producing quite as marked nervous phenomena as the analogous condition in the male, some of which are irritable bladder, nervous disturbances, masturbation, absence of sensation, and convulsions. The occurrence of such symptoms should direct attention to the clitoris as a possible cause.

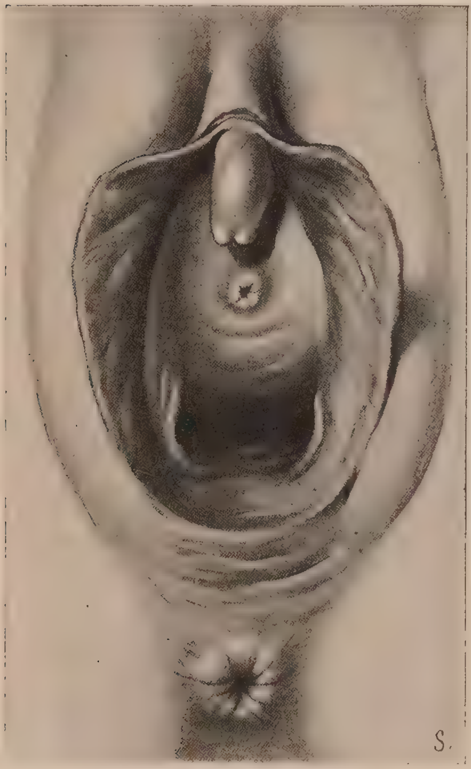


FIG. 183. Enlarged Clitoris.

Treatment. When the clitoris is so large as to interfere with coition, a portion of it may have to be removed, but the operative procedure should, if possible, be so designed as to retain the glans as the seat of sensation. If the glans is covered by an adherent prepuce, it should be thoroughly exposed by pushing back the prepuce. The adhesions can readily be broken up with a probe or a grooved director. When the prepuce is so long as to form a hood and completely envelop the glans, it should be retracted by removing an elliptic piece of integument about half an inch above the clitoris, with the long diameter of the ellipse parallel to the cleft of the vulva. This denuded portion should be closed by sutures introduced in its long axis. The length of the denudation necessary depends upon the projection of the prepuce. The prepuce may be dissected away and the cut edges sutured so that the glans subsequently remains exposed. A better procedure is to remove the margin of the prepuce around the glans, practically doing a circumcision, after which the cut edges should be united with catgut sutures.

195. Defects of the Hymen. The hymen is composed of tissue analogous to the corpus spongiosum in the male. It partly closes the vaginal orifice, and has upon its superior surface the foldings of the mucous surface of the vagina. It is generally crescentic (Fig. 8), with the concave margin anterior. It can present an annular opening (Fig. 8); two openings, separated by a septum (Fig. 12); or a number of openings (Fig. 13)—the cribriform. It sometimes resembles in appearance the infantile form, when it is infundibuliform (Fig. 11), or its edges may be dentated (Fig. 10) or serrated. Its normal situation is just within the vulva, where it is exposed by separation of the labia. In the colored race its situation is higher. Its opening in the marriageable woman will easily admit the tip of the finger. *Atresia* has been described. (Section 191.) *Supernumerary hymen* have been reported, but these are probably congenital bridles in the vagina. *Congenital absence of the hymen* must be questioned. The hymen is generally a thin membrane, which ruptures during the first coition (Fig. 14) and sloughs away after confinement, leaving as remnants the carunculæ myrtiformes. The laceration may be central, posterior, triangular, or stellate. After a single coition the torn surfaces may unite. I have seen two patients in whom the hymen was so firm as to form an actual barrier to coition, requiring incision to render the act possible. Cases are reported where it did not rupture during labor, or offered such an obstacle to delivery as to require incision. Its laceration is not usually attended with bleeding, but occasionally it is followed by severe, and even dangerous, hemorrhage.

Incision is made with bistoury or scissors, while the labia are widely separated. Two posterior lateral incisions are preferable to a single posterior. Hemorrhage, if severe, should be controlled by a vaginal tampon, or, preferably, by a suture.

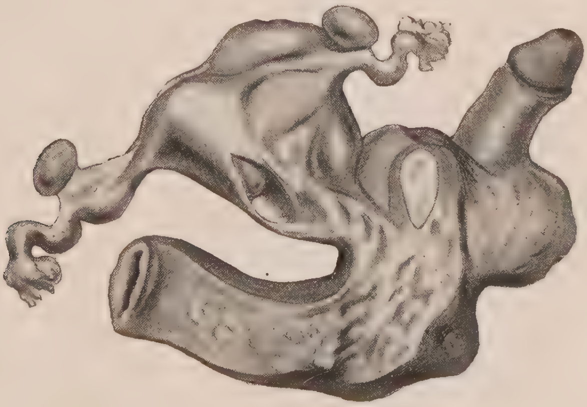


FIG. 184.—Apparent Hermaphroditism. (*American Journal of Obstetrics.*)

196. Hermaphroditism is a condition in which there is a real or apparent union of the two sexes in the same individual. It is doubtful whether the organs of both sexes exist complete in any one individual, although there are numerous instances in which the penis has been found well developed, with a testicle upon one side, while within were found a uterus and an ovary upon the other side of the body. The case represented in figure 184 presents characteristics of the two sexes, but, like many other such cases, requires a microscopic examination to demonstrate the presence of both ovaries and testicles in the same individual.

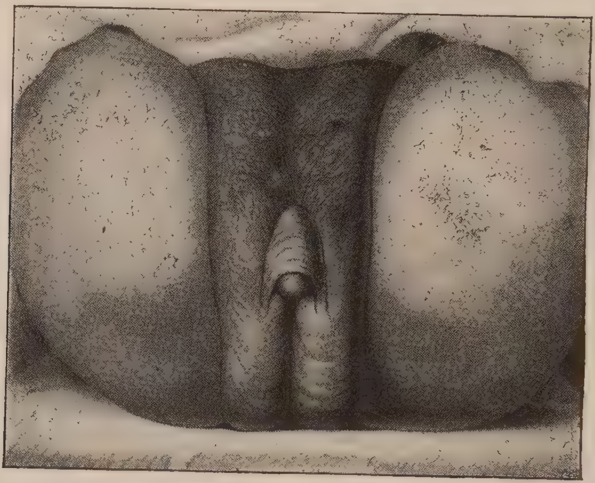


FIG. 185.—External Genital Organs of Madam Le Fort. (*Auvard.*)

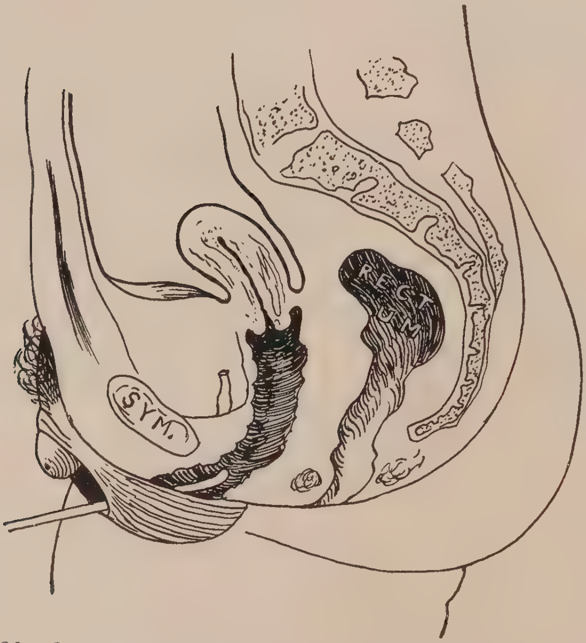


FIG. 186.—Outline of Internal Organs of Madame Le Fort. (*Auvard.*)

Pseudohermaphroditism is a condition in which there is such an apparent union of the sexual organs of the two sexes, or such a malformation, or defective development of the male organs or excessive development of those of the female, as to render the determination of the sex of the individual during life difficult, if not almost impossible. Pseudohermaphroditism is divided into masculine and feminine, according to the presence of testicles or ovaries. The females resembling men form a class known as the gynandria, while the man resembling the female is classed as an androgynus.

Gynandria. The external organs of the female resemble those of the male. The clitoris is large, with possible fusion of the labia majora, not infrequently of the labia minora, simulating the scrotum and concealing the vulvar opening. This resemblance is still more striking when there is associated an ovarian hernia into the labium majus. The internal organs may be irregularly developed. The hypertrophy of the clitoris does not necessarily change its form, and may arise in women who are addicted to masturbation. The labial fusion may be so firm as to require incision.

An example of this class is Madeline Le Fort (Auvard) (Fig. 185), who was declared to be a female by Béclard when she was six years of age. The clitoris was very large; a groove upon the under surface led to a depressed urethra in the cleft of the vulva. The vagina was replaced by a small conduit, from eight to 10 centimeters long, bordering upon a well-formed uterus. (Fig. 186). Menstruation occurred at the eighth year, and escaped from an orifice situated at the root of the clitoris. Her general appearance was strongly masculine, and she was sexually indifferent.

Androgyna predominates, and its individuals are frequently monorchid or cryptorchid males, presenting external characteristics of the female, such as enlarged breasts. The penis may be perfect, but the nondescent of the testicles and a median depression in the scrotum resembling the labia majora will give a distinctly feminine aspect. Arrested development of the penis, hypospadias, and fissure of the scrotum greatly increase the resemblance. (Fig. 187.) Such persons are generally dressed, reared, and educated as girls, and have been married without being aware of their true sex.

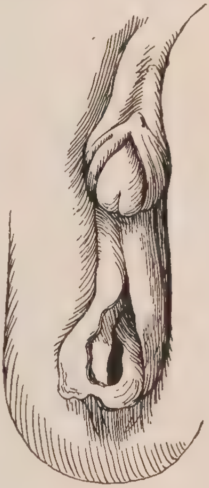


FIG. 187.—Androgyna. (*Pozzi.*)

The determination of sex is of great importance. It requires careful consideration of the size, shape, and general configuration of the body. The testicle may be small, and be retained within the abdominal cavity. The seminal secretion is generally sterile. The breasts resemble the feminine, as do also the buttocks and thighs. The larynx is not prominent and the beard is scanty or absent. The rectal touch, with the catheter in the bladder, may fail to reveal either uterus or prostate. The mental condition is generally feeble or poorly balanced. When careful examination fails to render the sex certain, the individual should be classed as a male. Independent of increased freedom and larger opportunities for acquiring a livelihood, the imperfect male is less likely to enter upon the marriage relation. When the sex of the individual is in doubt no operation for correction of the condition should be done, unless preceded by an abdominal section to ascertain the character of the internal genital organs.

197. Hypospadias is much more rare in the female than in the male. The vestibule is absent and the orifice of the urethra is not visible to inspection. Generally, the apparent hypospadias is really a persistence of the urogenital sinus. The urethra can be wholly absent, and the bladder may present a crescentic opening into the vagina. It is often associated with prolapse of the bladder-wall, and incontinence is usually present.

198. Epispadias is still more rare. It presents four varieties: (1) The corpus spongiosum is divided, and the urinary sinus is situated in the posterior surface of the clitoris; (2) added to the former condition there is a partial defect of the anterior urethral wall; (3) the anterior wall of the urethra is entirely absent, the clitoris is bifid, and the labium minus is attached on either side to a portion of the glans clitoris, while the pubic symphysis may also be defective; (4) exstrophy of the bladder, in which the anterior wall of the abdomen, with that of the bladder, is absent and the posterior vesical wall protrudes. The ureters open upon the surface, and the parts are constantly soiled with urine.

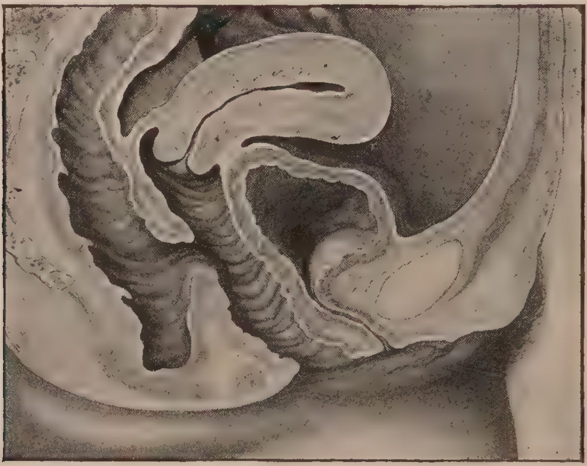


FIG. 188.—Imperforate Anus. Communication between Rectum and Vagina.

The first form of epispadias is very rare, the last most frequent. While vesical ectopia is prone to result in disease and obstruction of the ureters, which lead to hydronephrosis and early death, nevertheless histories of patients have been reported who have reached old age. The occurrence of epispadias and associated incontinence is not inimical to the occurrence of conception, and cases of pregnancy at full term are recorded.

Treatment. The urethra may be established by denuding and suturing the surfaces, but failure to secure a good result is frequent. Ectopia of the bladder is difficult of correction. It is preferable not to attempt an operation during infancy, owing to the friability of the tissues and the probability of sutures cutting through. Transplantation of the ureters into the rectum probably affords the most satisfactory solution of the problem.

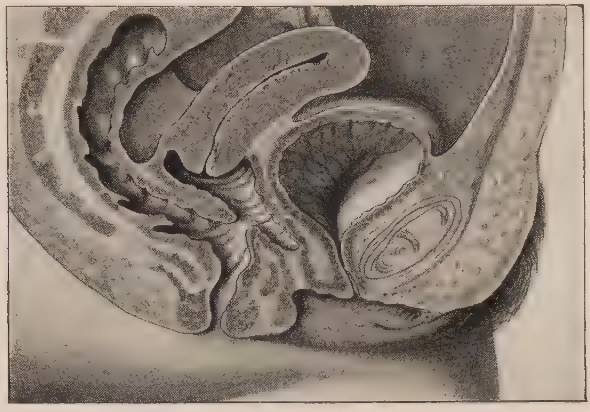


FIG. 189.—Congenital Defect of Vagina. Communication with the Rectum.

Duplication of the bladder has been found associated with a similar condition of the genitalia.

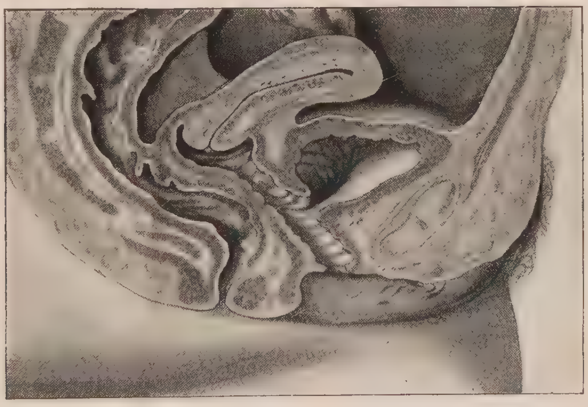


FIG. 190.—Congenital Absence of the Urethra. Communication of Bladder with the Vagina.

Permeability of the urachus and discharge of urine from the umbilicus are results of congenital closure of the urethra, but sometimes occur independently. It is much more frequent in boys than in girls.

199. Irregular Exit of Ureter. Opening of the ureter into the vagina has been described, but these are probably cases in which the supposed vagina is really a rudimentary bladder. I had an opportunity to examine a young woman in whom the bladder was rudimentary and the vagina formed a receptacle in which urine accumulated and prevented incontinence becoming complete. Baum describes an accessory ureter which opened at the side of the urethra. He operated by making an incision above the symphysis, cutting through the bladder upon the ureter, which he divided, tying the distal end, while the other was brought into the bladder. The procedure overcame the incontinence.

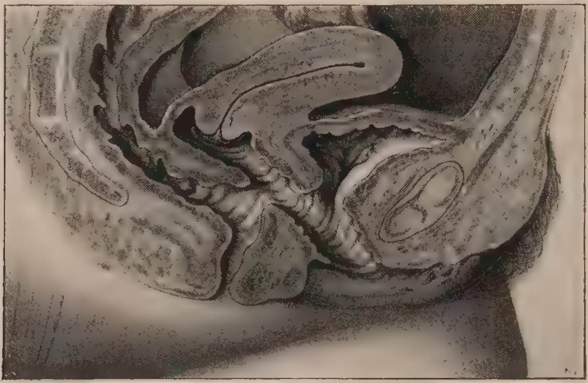


FIG. 191.—Communication of Rectum and Bladder with the Vagina.

200. Abnormal Communications. Errors in development may produce imperforation of one of the canals which perforate the pelvic fascia or result in the union of two or three of them. In any case the cause is analogous: *i. e.*, failure to accomplish the union between the superficial and deep organs. Imperforations of the anus and urethra are vital, calling for prompt attention of the surgeon. Imperforation of

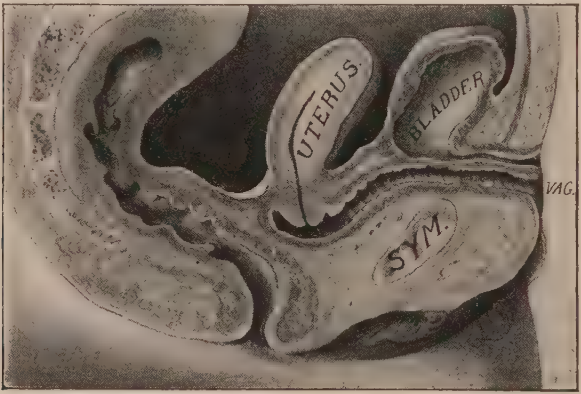


FIG. 192.—Suprapubic Opening of Vagina and Urethra.

the vagina has been considered. (Section 188). The communications may be:

1. Rectovaginal. (Fig. 188.) The vagina and urethra are normally developed. The anus is imperforate and, therefore, the fecal material is discharged by a rectovaginal opening through the vagina.

2. *Vaginorectal.* (Fig. 189.) The rectum and urethra are normally developed, excepting the opening into the former from the incomplete vagina.

3. *Vesicovaginal.* (Fig. 190.) The rectum and vagina are normal in appearance, but the urine escapes through the latter, the urethra being absent.

4. Rectovaginovesical. (Fig. 191.) The rectum and bladder both communicate with the vagina. The urethra is generally absent. The anus may or may not be perforate.

5. *Suprapubic* opening of vagina and urethra. (Fig. 192.) This condition is extremely rare.

TRAUMATISMS.

201. Injuries of the genital organs of sufficient gravity to produce temporary or permanent structural changes, or to influence the subsequent health and comfort of the patient, for the most part are limited to lesions of the vulva, vagina, and cervix.

The causes productive of such conditions usually may be assigned to one of three general classes, viz.:

1. External violence.
2. Coition.
3. Parturition.

202. External violence as a cause of injury is comparatively infrequent.

The injuries occur in a variety of ways.

A woman standing upon a chair or step-ladder falls astride the back, or upon the post or round of the chair.

Bovée reports a young girl who fell from her bicycle upon the lamp bracket and sustained a complete laceration of the perineum. Lacerations may be produced by sliding down bannisters and striking against the newel post, by sliding from a haystack or haymow, falling upon the handle or prong of a fork or upon a hay-knife. Howe mentions a young woman who slid upon the handle of a fork, which entered the vagina and penetrated the abdominal cavity twenty-two inches. She ultimately recovered. Curran cites the case of a patient in whom the horn of a goat entered the anus and tore through the vagina. Girls have been impaled upon barrel staves, fence palings, or the sharp stump of a sapling. A chamber or slop-jar breaking under the patient has been the cause of injury. The fracture of a glass-ball pessary in the efforts at its removal has produced vaginal laceration and even fistula. Royster reports two cases of complete laceration of the perineum in young girls, which were caused by the finger of the obstetrician while they were yet within the body of the mother. The injury may be a free incision, a ragged laceration, or a severe contusion. The incision may be produced by striking upon a blunt object, the sharp edge of the rami cutting through the overlying tissues. Large vessels may be ruptured without the skin being broken, when a severe hemorrhage will occur into the tissues. In the former case the hemorrhage will be open; in the latter, concealed.

Treatment. The injury of vessels and the resulting hemorrhage into the tissues are called pudendal hemorrhage (see Vulvar Hematoma). This may demand evacuation, and the resort to measures for the control of the bleeding vessels.

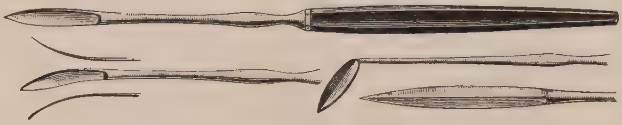


FIG. 193.—Knives for Denudation.

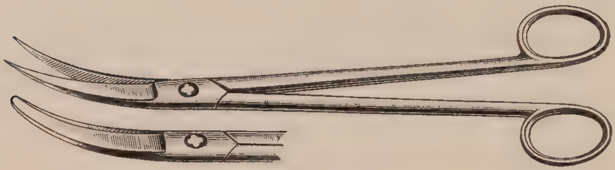


FIG. 194.—Curved Scissors.

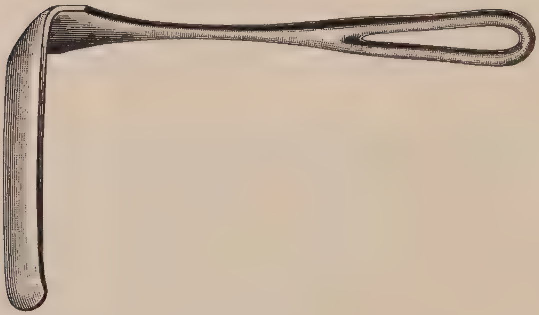


FIG. 195.—Retractor.

Severe hemorrhage following an injury should demand an inspection of the injured part and measures for its control. Where a large vessel bleeds the wound, if necessary, should be enlarged and the vessel ligated. Frequently the hemorrhage can be controlled by the sutures used to close the wound. Often general oozing from a ragged opening is controlled best by gauze pressure. The wound must be cleansed carefully and kept in an aseptic condition.

203. Coition, as is well known, causes a rupture of the hymen which guards the vaginal opening. Laceration of this structure is usually central and posterior. It may, however, be bilateral. Occasionally, the hymen is so firm as to resist all attempts at coitus, and therefore will require incision before the act can be accomplished.

The entire vaginal canal is more or less dilated by repeated coition, as evidenced by the enlarged and roomy canal which distinguishes the nulliparous from the virgin vagina. Severe lacerations of the vulva and vagina the result of sexual intercourse are rare, except when produced by rape of young girls. Instances are reported, however, in which injuries of gravity have been produced, as tearing off the hymen, perforation of the posterior vaginal wall, rupture of the perineum, formation of rectovaginal fistula, and perforation of the posterior vaginal fornix. Such injuries are more likely to occur in those who come to the first coitus late in life, or in whom there have been premature atrophic changes. Skrobanski, however, cites a peasant, aged twenty-two years, in whom the first coitus caused a rupture of the perineum, two centimeters in depth, but without entering the rectum. R. Abrahams reports the history of a woman twenty-six years old, in whom a rectoperineal fistula was produced which permitted the introduction of two fingers.

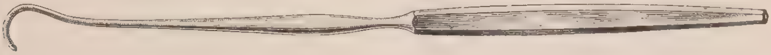


FIG. 196.—Blunt Hook.

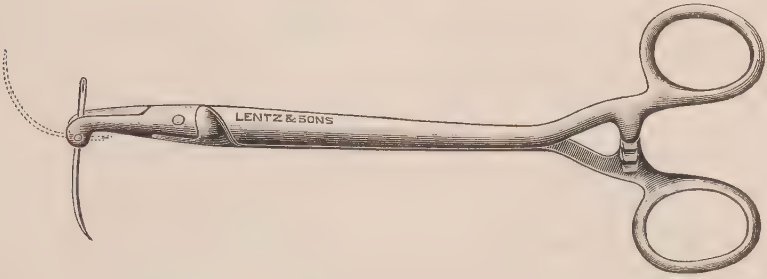


FIG. 197.—Doyen Needle Holder.

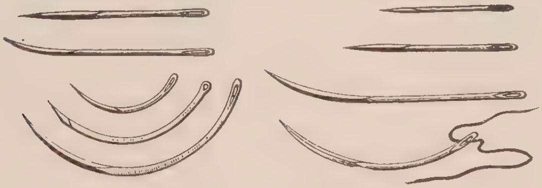


FIG. 198.—Needles.

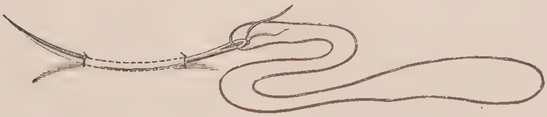


FIG. 199.—Needle with Loop for Suture.

Occasionally the first coitus is followed by a hemorrhage so active as to endanger the life of the woman. The bleeding is best controlled by the introduction of a suture to include the spurting vessel.

Treatment. Injuries resulting from the sexual act are rarely of sufficient importance to demand surgical interference. If severe, the treatment will depend upon the character and extent of the injury. An extensive laceration should be sutured. The sexual act should be discontinued until the injured parts have fully recovered, and then should be practised with the utmost gentleness and care.

204. **Parturition.** Maternity is not without its penalty. The great majority of injuries to which the genital organs are subject occur during or as the result of labor. The injuries are due to faulty anatomic conditions, as distorted pelves, rigid, unyielding muscles, inflamed and undilatable cervices, abnormal positions of the fetus, disproportion between its size and that of the pelvis, violent uterine contractions, long-delayed and feeble contractions, and premature or too long postponed instrumental or manual interference.

The long-continued pressure of the fetal head impacted in the pelvis is probably even more disastrous than the premature delivery by the application of forceps. Indeed, vesicovaginal fistulæ, which were of frequent occurrence prior to the intelligent use of the forceps, now rarely come under observation. The injuries are of great variety and affect the uterus—both body and cervix—the vagina, the vulvar outlet, and particularly the perineum.

205. **Injuries of the body of the uterus** may occur in the form of lacerations of its anterior or posterior wall, in a vertical or transverse direction, and may be slight or sufficiently large to permit the escape of the fetus and placenta. Following an abortion, the softened uterine wall occasionally is perforated by the curet or placental forceps, or both. Through such a perforation loops of intestine have been drawn into the uterine cavity—even through the os—and subjected to serious injury. Injuries of the uterine body are not confined to parturition alone. The walls of the inflamed or flexed nonpuerperal organ are perforated frequently by the use of a sound, bougie, or other dilator. In the removal of fibroid growths, the weakened wall can be opened by the removal of the tumor which projected through it, or the fundus uteri can become inverted and be incised in its removal.

Treatment. The proper treatment of rupture of the uterine wall during labor will be found in the text-books on obstetrics. Perforation of the softened walls of the uterus may occur readily in the effort to remove decomposing placenta or membrane during an abortion, and should demand careful subsequent observation. The retained fragments should be removed, where possible, by the finger; placental forceps should be used only with the finger as a guide. Evidence of perforation as presented by bringing a coil of intestine to the os should require careful return of the knuckle of the intestine and the operator should be absolutely certain that it has been pushed entirely through the uterine wound, when he may pack the uterus with iodoform gauze.

The appearance of shock, marked disturbance of temperature, continued and severe irritation of the stomach, or other indications of peritonitis should be recognized as urgent indications for abdominal section. Perforation of the uterine wall by sound or bougie, unless associated with severe infection has but little significance. However, irrigation with irritating fluids is to be avoided and drainage of the uterus must be secured by gauze. Rupture of the uterus during removal of fibroid growths should be considered an indication for immediate closing of the wound through an abdominal section.

206. Injuries of the cervix uteri are described under the term *laceration.* Laceration of the cervix is the most frequent lesion of labor. It is exceedingly rare for a woman to undergo her first parturition without tearing of one or both sides of the cervix. The tear may vary from a slight fissure, which completely disappears during convalescence, to an extensive laceration, extending to or into the vaginal fornices.

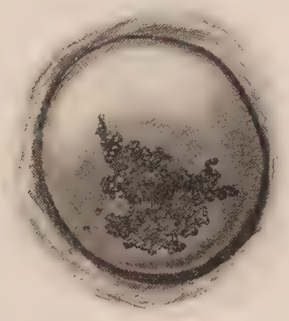


FIG. 200.—Slight Fissure of Cervix.

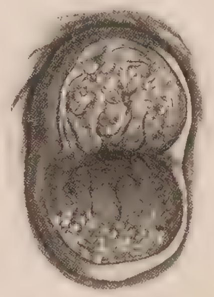


FIG. 201.—Extensive Laceration of Cervix. (*Munde*).

Lacerations of the cervix are unilateral, bilateral, stellate, or through the anterior or posterior lip. The bilateral is the most frequent. The unilateral is found more frequently upon the left side, owing to the greater preponderance of the left occipito-anterior position. Lacerations can occur into the cellular tissue laterally, or into the bladder in front, and in the latter cause a vesico-uterine fistula. (See Section 216.) The cicatrization of a lateral tear may produce a band or bridle which tilts the fundus uteri to the opposite side.

Symptoms. Laceration of the cervix presents no special or specific indications of its existence. The symptoms are those produced by the complicating conditions. The lesion causes subinvolution and a consequent increased weight. A bearing-down sensation, discomfort in standing or walking, and pain in the sacrum and iliac regions are common. The lower level maintained by the organ and the traction of the vaginal wall upon its lips lead to separation of the latter, eversion of the cervical mucous membrane, thickening of the tissue from its exposure, and fixation of the everted lips. Irregular or excessive menstruation, or metrorrhagia, is not infrequent. Bleeding is excited by locomotion, coition, or sexual excitement. The endometritis causes a profuse leukorrhea, which constitutes a double drain. The cicatricial bands and everted lips not only permit a depression of the uterus in the pelvis, but produce either lateral version or retroversion, according to the unilateral or bilateral character of the lesion. The efforts at repair of lacerated surfaces results in the formation of extensive scar tissue in the angles of laceration which is often associated with profound neurotic or reflex phenomena. These frequently are benefited by proper surgical measures. Not infrequently neurasthenia may be engendered by pressure of the cicatricial tissue upon the nerve filaments. Pressure against such indurated tissue aggravates the discomfort.

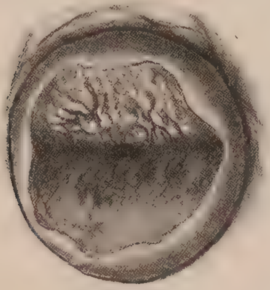


FIG. 202.—Bilateral Laceration of Cervix. (*Munde.*)

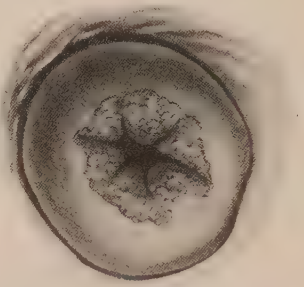


FIG. 203.—Slight Stellate Laceration of Cervix. (*Munde.*)

Diagnosis. A laceration of the cervix is readily recognized by the finger, but its apparent presence must not be accepted as proof positive of previous pregnancy, for a congenital fissure can exist which will permit as marked an eversion of the lips as would be produced by a deep bilateral tear. The finger will disclose the condition of the lesion, the extent of the tear and of its cicatrization, the eversion of the lips, the presence of erosion (disclosed by its soft, velvety feel), or the existence of eversion of the cer-

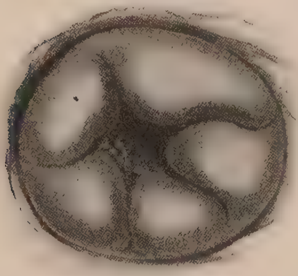


FIG. 204.—Extensive Stellate Laceration of Cervix. (*Munde.*)

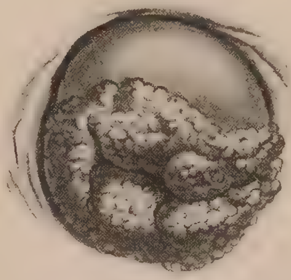


FIG. 205.—Laceration of Cervix with Hypertrophy and Eversion of Cervical Mucous Membrane. (*Munde.*)

vical mucous membrane. Inflammation and obstruction of the glands of Naboth will be revealed by small, shot-like masses studding the cervix. As the finger is passed upward the lips are found to spread out, like the top of a celery stalk, but hard, dense, and fixed.

The bivalve speculum, in drawing upon the anterior vaginal wall, aggravates the eversion. The tubular speculum flattens the surface frequently, removes all trace of the fissure, and leads to its being mistaken for granular erosion. The Sims or some retraction speculum affords the best exposure. Seizing each lip with a tenaculum and drawing them together discloses the extent of the tear. (Fig. 206.) The surface of the tear is sometimes covered with exuberant granulations which bleed upon the slightest touch. (Fig. 205.) These phenomena, with a profuse and sometimes offensive discharge, often renders the differentiation from epithelioma exceedingly difficult. The diagnosis may be established by the results of treatment, or, better, by microscopic examination of a section of tissue.

Treatment. Immediate examination after labor to ascertain the extent of the laceration is generally impracticable because the cervix is so drawn out and thinned that it is difficult to determine the injury. The majority of small lacerations close spontaneously under the use of ordinary antiseptic precautions. The occurrence of severe arterial hemorrhage should require an examination to ascertain its source, and, when found, the hemorrhage is best controlled by suturing the lacerated surfaces. Not every laceration requires an operation, and if not done within ten days, three months should pass before it is repaired. I quite agree with Dickinson that the period of choice for operation is five to seven days following the occurrence of the injury. Then involution has taken place sufficiently to permit the lesion to be disclosed, and operation favors normal involution, thereby lessening the danger of endometritis and other complications. Small fissures which are inclined to close, or have cicatrized, do not require an operation. When the lesion is complicated with endometritis, the latter should be treated. Operation in slight cases is to be condemned, as it obstructs drainage and may be the cause of extension of disease to the tubes and pelvic peritoneum. Repair is indicated in deep laceration; in eversion with hypertrophy and cystic degeneration of the mucous membrane; in cicatricial formation at the angles of the fissure associated with nervous phenomena; and in subinvolution and endometritis. Surgical interference should not be employed for slight lacerations, nor those which have cicatrized, in tubal or periuterine disease, except when associated with abdominal section to correct the complication.

Complications. The presence of endometritis, associated with marked eversion and hypertrophy of the mucous membrane, requires treatment prior to operation for cervical laceration. The patient's diet should be regulated, constipation corrected, and appropriate measures instituted to relieve the accompanying anemia. She should be permitted to take twice daily a vaginal douche of hot water containing an ounce of rock salt to the quart. The cervix should be scarified or punctured, thus securing depletion. All obstructed Nabothian glands should be punctured and the gland cavity painted with Churchill's tincture of iodin, a combination of tincture of iodin and creasote (2:1), iodin crystals dissolved in 95 per cent. carbolic acid solution, silver nitrate (ʒj to f℥j), zinc chlorid (ʒj to f℥j), or a solution of argyrol, or pyroligneous acid. The superfluous material should be sponged away and a tampon of gauze and cotton applied beneath the uterus. The organ thus raised to a higher level the sensation of weight or heaviness is removed and the circulation is improved.

The tampon may consist of plain sterilized gauze and cotton, or gauze medicated with iodoform, carbolic or boric acid, or thymol. Sublimated gauze should not be used as it irritates the vagina and causes pruritus. The tampons may be medicated with preparations of glycerin, a 50 per cent. solution of boroglycerid, the official iodoform ointment, or a 10 per cent. solution of ichthyol. In place of the glycerin the tampon may be medicated with an ointment, such as 25 per cent. of ichthyol in lanolin. The local treatment, associated with a tampon, should be employed twice a week, and the tampon removed at the end of forty-eight hours, to be followed twice daily by a vaginal douche of half a gallon of hot salt water (temperature from 110° to 120° F.). The douches are preferably given with a fountain (gravity) syringe, while the patient is in a recumbent position on a bed-pan. Where the cervix and the neighboring tissues contain a large amount of inflammatory exudate the bulb (Davidson) syringe, by force of its current, exercises a salutary influence in promoting absorption. A profuse discharge of glairy mucus from the surface should be removed with a blunt curet or sucked off with a syringe. The curet presses, or the syringe draws, the mucous collections from the cervical glands and permits the application to come directly in contact with the diseased surface. The medicament may be applied by means of a cotton wrapped probe, carried into the canal with a pipet, or a few drops may be introduced with a Braun syringe. However, intracervical or intrauterine applications should not be made, unless the cervical canal is quite patulous, so that the fluid or increased serous discharge can escape readily. If the canal is obstructed by hypertrophied and everted mucous membrane, gauze packing, or the use of a laminaria tent, (Section 56) will render the application more effectual and safe. Irregular bleeding or profuse leukorrhea should indicate the use of the sharp curet and dilatation.

℞.	Alum	ʒj
	Acid, carbolic,	℥iv
	Glycerin	ʒxij

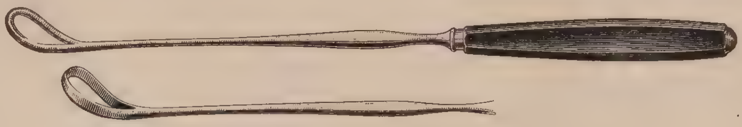


FIG. 206.—Blunt and Sharp Curets.

The uterus should be irrigated during or following curetment with a disinfectant solution, bichlorid, 1:3000; formalin, 1:1000, a hot soda solution, 4 drams to 2 pints, or preferably with 1 per cent. salt solution, and swabbed with a saturated solution of iodoform in ether. If for any reason there is much bleeding following the procedure, the uterine canal should be packed with iodoform gauze.

207. **Trachelorrhaphy** (that is, neck-sewing), or *hysterotrachelorrhaphy* (that is, womb-neck sewing), is an operation devised by Emmet for the relief of laceration of the cervix. The patient, prepared (Section 131) and anesthetized (Section 137), is placed upon a table in the lithotomy position, with a perineal pad beneath her buttocks to carry the irrigating fluid into a slop-jar at the end of the table. Each leg is held by an assistant or secured by a leg-holder. The following sterile instruments (Section 125) have been placed in a tray upon a table at the operator's right: a scalpel or bistoury; curved scissors; long, rat-toothed dissecting forceps; two double tenacula; a retraction speculum (Edebohls'); six pressure forceps; a needle-holder; four strong needles, curved and bayonet-pointed, each threaded with a loop of silk to serve as a suture carrier. A smaller tray will contain the suture material. My preference for sutures is chromic catgut, which has the advantage that it does not have to be removed (Section 127). The nurse at the operator's left should have charge of the sponges. These should preferably be sterilized gauze, though absorbent cotton wet with sublimate solution, 1:2000, can be employed. A fountain syringe, filled with hot normal salt solution or some disinfecting fluid, should be suspended, so that the field of operation can be kept clean by constant irrigation. The final preparation of the patient (Section 131) completed, the cervix is exposed with a speculum, and each lip so seized with a double tenaculum as to turn in the everted edges when the lips are apposed. (Fig. 207.) The assistant upon the operator's left holds the anterior lip by the tenaculum and controls the irrigation tube; the one upon the right attends to the necessary sponging. The posterior lip is held by the weight of the tenaculum. With the knife the operator cuts through the cicatricial angle, and in a bilateral laceration with scalpel and forceps denudes a corresponding surface upon each lip, first upon the left, then upon the right. The knife is preferred to the scissors, as the denudation can be made more evenly and with less bruising of tissue. The denudation is, of course, limited to one side in a unilateral tear. Where a bilateral tear is slight on one side and deep on the other, the denudation should be confined to the latter.

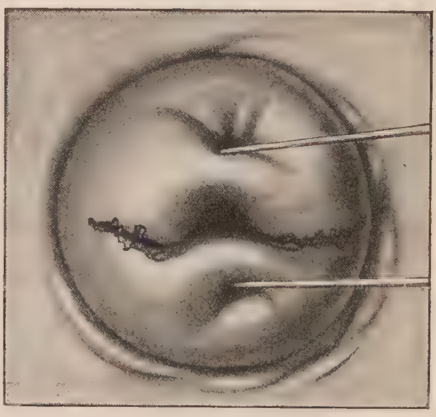


Fig. 207.—Edges of Laceration Turned by Tenaculum Hooked into Each Lip.

A strip of undenuded mucous membrane, one centimeter wide, should be left in each lip for the future cervical canal (Fig. 208), and the precaution should be exercised not to encroach upon the vaginal surface of the cervix in the removal of the tissue. In deep lacerations the circular artery may be opened in the denudation. It should be seized with pressure forceps, and the first suture should be so introduced as to control it.

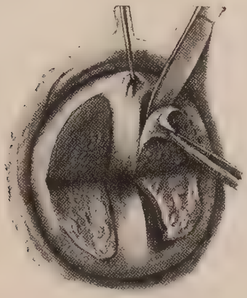


Fig. 208.—Denudation of Lacerated Cervix.

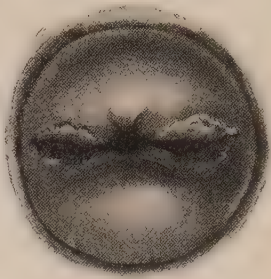


Fig. 209.—Surfaces Denuded Ready for Union.

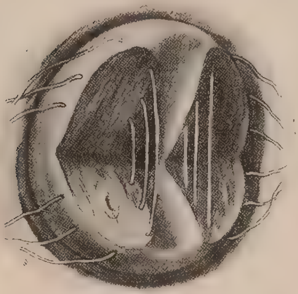


Fig. 210.—Sutures Introduced.

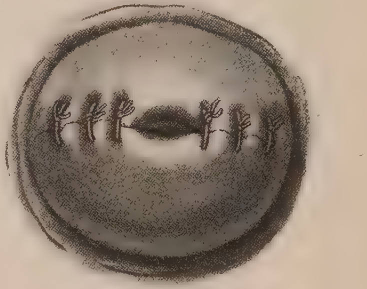


Fig. 211.—Sutures Tied.

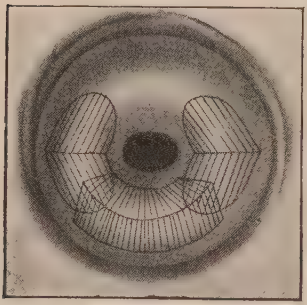


Fig. 212.—Double Flap Amputation of the Cervix. (*Auvard.*)

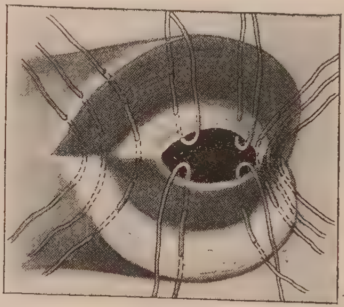


Fig. 213.—Sutures Introduced. (*Auvard.*)

The sutures are placed by introducing the needle about three millimeters from the vaginal edge of the wound, bringing it out at its cervical margin, introducing it at a similar point in the other lip, and bringing it out in the vagina. Ordinarily, three sutures will be sufficient upon each side. Occasionally the laceration will be so deep that the angle suture cannot be placed properly by passing the needle as we have just described. Then it is introduced preferably from within outward, which can be done by carrying the ends of the suture, by means of the carrier, through first the posterior and then the anterior lip, or with two needles threaded with carriers, each passed from within outward, the one anterior and the other posterior. One carrier can be passed through the loop of the other and drawn out. The loop thus carried through serves to carry the suture. The sutures are tied, superficial sutures are introduced, if needed, and the vagina is thoroughly irrigated. If bleeding should continue, a suture should be introduced well above the denudation to control the bleeding vessel. Avoidance of subsequent hemorrhage is particularly desirable if a plastic operation is to be performed upon the vaginal outlet also.

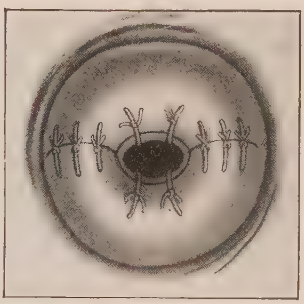


FIG. 214.—Wound Closed.

208. Amputation of the cervix is to be preferred when the cervix is much elongated and hypertrophied, when the mucous membrane has become extensively hypertrophied and everted, or when cellular proliferation justifies the suspicion of incipient malignant degeneration, although when the latter condition is established, complete hysterectomy should be advised.

The amputation can be made by the double or single flap method for each lip. The instruments and preparations are similar to those given in the previous section (Section 206).

Double Flap Operation. The lips of the cervix are seized and separated by double tenacula; an incision is made in each angle to the point at which it is desired to make the amputation. A wedge-shaped piece is removed from each lip, forming cervical and vaginal flaps. Two sutures are then introduced in each lip, uniting the cervical and vaginal mucous membranes. On each side a suture is passed in through the anterior vaginal and cervical flaps, out through the similar posterior flaps, and external to this such sutures are inserted as are necessary to bring in apposition the raw surfaces. The sutures are tied and superficial sutures introduced, if necessary, to adjust the edges of the wound nicely. The more accurate the adjustment, the less will be the subsequent contraction.

Single Flap Method. Schröder's operation consists in making the denudation at the expense of the internal or cervical portion of each lip. This operation is preferable when the cervical mucous membrane is so diseased and hypertrophied as to render its retention for the formation of a flap undesirable. In this, as in the former operation, a lateral incision is made and the lips are everted. Instead of a cervical flap a transverse incision is made into the lip from within outward, at the level of the lateral incision, cutting half through the lip; then a vertical incision to the junction of the cervical and vaginal mucous membranes. Two sutures unite the end of each flap to the corresponding cervical mucous membrane, and the remaining raw surfaces are adjusted by lateral sutures.

After-treatment does not differ in the various operations upon the cervix. In the use of the chromic catgut suture no provision is made for its removal, but it is important to prevent its becoming infected. Unless the vaginal outlet is to be the seat of an operation, the vagina should be packed loosely with gauze, which should be removed in two or three days. The patient is kept in bed for two weeks, and then gradually permitted to resume her ordinary duties. Any pain should be relieved by the application of an ice-bag to the abdomen. The patient should void her urine, and the catheter should be used only when it is impossible for her to empty her bladder while in the recumbent posture. Secure an evacuation of the bowels at least each alternate day. Avoid vaginal douches for the first forty-eight hours, affording the plasma opportunity to glue the apposing surfaces; then use a douche of hot sublimate solution (1:3000), formalin (1:1500), or what is preferable a 1 per cent. saline solution twice daily.

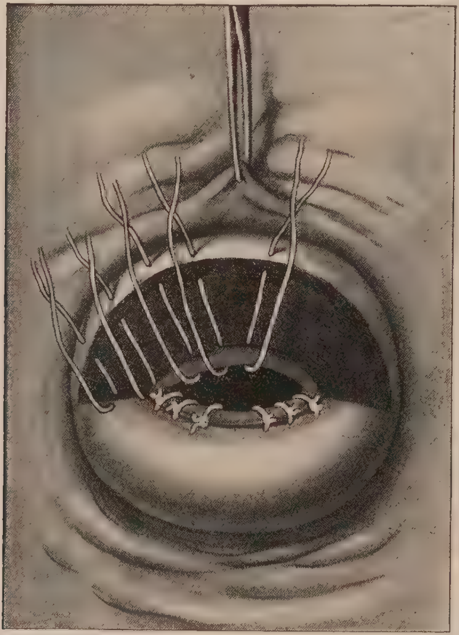


FIG. 215.—Schröder's Single Flap Operation.

Direct the patient to avoid worry or much exercise during the next menstrual period, and not to resume the sexual relation for one month.

209. Lacerations of the Vagina. Small tears of the anterior, posterior, or lateral wall of the vagina are not infrequent, and result in cicatrices which produce more or less disturbance of the pelvic functions. Separation of the muscular wall can occur without lesion of the mucous membrane. Not infrequently the entire vagina is crowded away from its muscular attachments, so that it subsequently appears as a relaxed sac, falls into folds which drag upon the cervix, displace the uterus, or, when it is fixed, produce hypertrophic elongation of the cervix. The most frequent lesions are at the vaginal outlet, and involve that portion of the pelvic floor known as the perineum. These lesions of the vagina are so intimately associated with, and dependent upon, the condition of the perineum that their treatment will be discussed with the lesions of the latter, under the head of injuries of the pelvic floor. Lesions of the genital canal, especially of the cervix and vagina, may be induced by long-continued pressure of the head of the child during a protracted labor. The loss of tissue vitality will necessarily be dependent upon its severity and duration.

The loss of vitality may involve only the superficial structures, as an erosion or superficial sloughing, when the tissues may be regenerated.

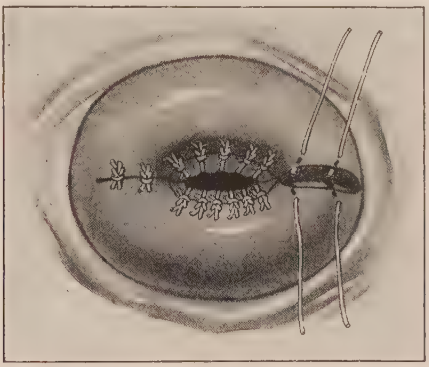


FIG. 216.—Schröder's Operation Completed.

If more extensive, there results contraction and stenosis or partial or complete obliteration of the canal, known as acquired atresia. This most frequently follows injuries occurring during parturition, but it can be produced by irritating injections and severe inflammations. Atresia vaginæ often occurs as a sequel of senile vaginitis. In one patient I found the entire vagina obliterated. The symptoms of such a condition are necessarily dependent upon the time of life at which it occurs. When it follows senile vaginitis, it often produces no symptoms outside those of marital inconvenience. During the menstrual life of the woman the symptoms are similar to those of the congenital variety. The patient suffers from menstrual molimina and a pelvic tumor follows. When the vagina is the seat of atresia, the condition is easily recognized, as is the uterine accumulation, if the obliteration occurs at the external os. When the obliteration occurs at the internal os, however, and the cervix is apparently normal, the diagnosis is more difficult, and the disorder may be confounded with fibroma uteri, malignant disease, or pregnancy. An analysis of the patient's history, associated with careful examination, should afford a reasonable suspicion as to its character.

FISTULÆ.

210. Fistulæ. Deep sloughs or extensive tears involving a portion of the genital tract not infrequently lead to perforation of one of the adjoining viscera, and then we have a fistula. The anterior wall is the most frequently affected, and consequently results in a urinary fistula, which may involve urethra, bladder, or ureter, or be associated with extensive destruction of vagina and cervix. Fistulæ are divided into urinary, fecal, and genital.

The genito-urinary fistulæ are:

1. Urethrovaginal.
2. Vesicovaginal.
3. Vesico-uterine. } (Fig. 217.)
4. Ureterovaginal.
5. Utero-ureterine.

The fecal fistulæ are:

1. Anovulvar.
2. Rectovaginal. } (Fig. 217.)
3. Enterovaginal.

Genital fistulæ are:

Anomalous openings in the cervix between the cervix and vagina. (Cervico-vaginal).

Etiology. Fistulæ are most frequently caused by the accidents of labor. These lesions are of less frequent occurrence than formerly. Improved methods of delivery expedite the progress of the fetus, save the maternal parts from long protracted pressure, and reduce the danger. Fistulæ are rarely the result of tearing, but generally follow a slough. Awkward use of instruments can result in perforation of the bladder, or rectum, or sever an ureter; but such lesions, except the last, present a marked tendency to spontaneous recovery.

Other causes of fistulæ are cancer involving the anterior or posterior vaginal walls, tuberculous disease, surgical operations, ulceration from the presence of a vesical calculus, the pressure of a pessary, abscesses or phlegmons.

Symptoms. The presence of a fistula communicating with the urinary tract is recognized by incontinence of urine and by the appearance of urine in the vagina. A fistula entering the intestine will permit the discharge of liquid feces and gas. A few days subsequent to her confinement the patient complains of being unable to retain her urine, or possibly it may come with a gush, following the partial or complete separation of a large slough. The parts are afterward continually bathed with urine, the skin becomes reddened and irritated, and the salts of the urine are deposited, increasing the irritation. The clothing of the patient is saturated with decomposing urine, causing a disgusting odor. Partial continence may be present if the opening is small, situated high in the vagina, or affects but one ureter. The influence of an intestinal fistula depends upon its size and situation. A small opening may permit the escape of the contents of the bowel only when they are liquid. The odor of the vaginal secretion is exceedingly offensive, so that the patient suffers an enforced retirement.

Diagnosis. Incontinence should at once cause fistulæ to be suspected. Large fistulæ are readily recognized by vaginal palpation. Small fistulæ, associated with cicatricial contraction of the vagina, are often difficult to inspect. The entire surface of the vagina should be exposed with retractors or with a Sims' speculum under a good light. If the opening is small, it will be revealed by injecting the bladder or rectum with milk or other colored liquid, when the opening will be observed as it escapes into the vagina.

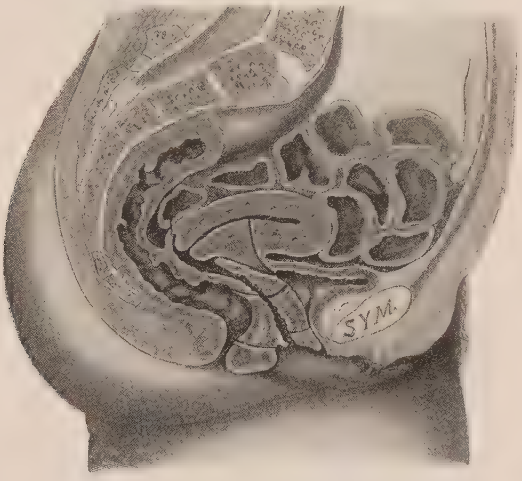


FIG. 217.—Scheme Showing Various Fistulæ.

This procedure affords a means for differential diagnosis between ureteric and vesical fistulæ and between the rectal and enteric. The escape of clear urine into the vagina when the bladder is filled with a colored liquid demonstrates the ureter as the origin of the fistula. The introduction of a ureteral catheter into the sinus and of a sound into the bladder permits the recognition of the intervening septum. If the opening is small and not visible, dry the surface and apply blotting-paper while the bladder is being filled. The paper will be moistened at the site of the fistula (Pozzi). The same object can be attained by packing the vagina with sterile gauze and injecting the bladder with colored fluid. The stain on the gauze will indicate the situation of the opening. In enteric fistulæ the vagina is constantly bathed with liquid feces, and the appearance of the discharge is not affected by rectal enemas. There is an offensive vaginitis and the patient suffers from inanition. In supposed uretero-uterine fistula the position of the ureters should be examined by Sänger's method.

(See Section 57.) It has been suggested that the patient urinate, then sit two hours upon a vessel, when a catheter is used; and if the quantity thus secured is equal to that in the vessel, there is a ureteric fistula. The collection has been obtained from separate kidneys. The two kidneys, however, do not secrete equally, and the distention of the bladder renders such a procedure unnecessary.

A fistula of one ureter may be inferred when, in spite of the periodical passage of urine through the urethra, the vagina is constantly bathed with urine; a vesical fistula near the neck may permit of no accumulation of urine, while a small one in the upper part of the vagina may allow soiling of the latter canal only when the patient is recumbent. In the upright position the desire to evacuate occurs before it reaches the level of the fistulous opening.

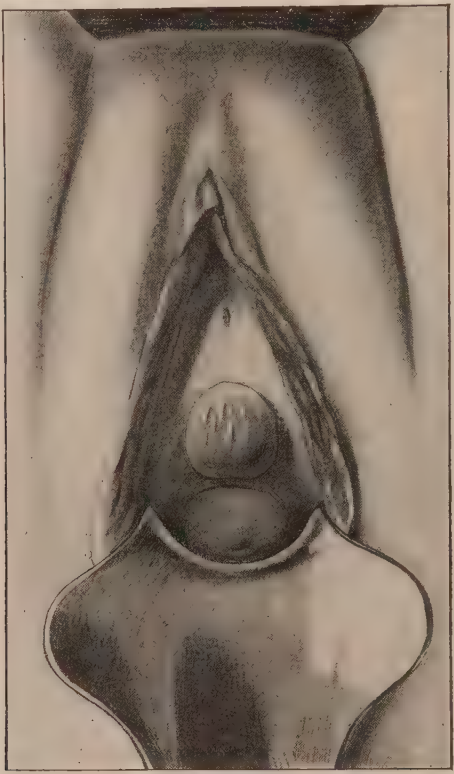


FIG. 218.—Large Vesicovaginal Fistula with Prolapse of the Anterior Vesical Wall through the Opening.

The most ready method of recognizing the ureteric fistula is by injecting the bladder with colored fluid. The continuation of uncolored fluid in the vagina demonstrates that we are not dealing with a vesical opening.

No operation should be attempted for rectal fistula without exclusion of rectal stricture.

Prognosis. The curability of a fistula depends upon its cause, situation, size, and duration. Those produced by cancer are a part of the progress of the disease, and are incurable unless the disease can be removed. Spontaneous recovery of a punctured or incised fistula is prone to occur under proper cleanliness, but an old sinus with hard, cicatricial edges requires surgical interference. An opening in the base of the bladder is more readily relieved than one in the upper part of the vagina or one in the urethra. Vesico-uterine fistulæ are particularly difficult, and the uretero-vaginal and uretero-uterine fistulæ are most trying.

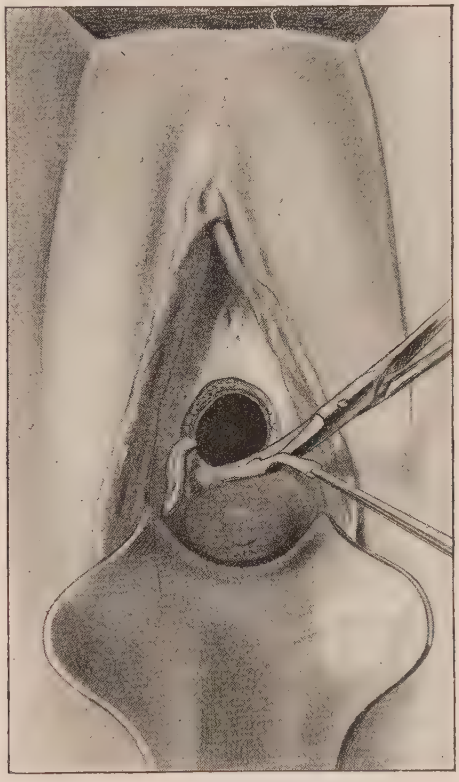


FIG. 219.—Denudation of the Edges of the Fistula.

Treatment. The methods of treating vaginal fistulæ as now recognized may be considered as:

1. Cauterization.
2. Denudation and suture of the edges of the fistula.
3. Flap-splitting, flap-sliding, and suture.
4. Flap-formation and sutures.

Cauterization is applicable only to fistulæ of small size and where but little cicatricial tissue exists. The thermocautery is the preferable means, although caustic potash, chlorid of zinc, or one of the stronger acids can be employed.

Preliminary treatment is important, whatever the method of operative procedure. The urine should be rendered non-irritating by the administration of benzoin salts or salol.

℞.	Ammon. benzoat.,	ʒiij
	Tinct. hyoscyami,	fʒiss
	Ext. buchu,	ad f℥ij. M.

SIG.—fʒj in water three or four times daily.

This prescription should be accompanied by the ingestion of large quantities of water. Salol, gr. ij–iij, may be given with a glass of hot water three or four times daily. Hot or soothing vaginal douches should be freely employed, such as a solution of sodium hyposulphite (ʒiv, aq. Oj) or weak solutions of the lead salts. If there is an incrustation of the lime salts about the orifice and over the vagina, employ a solution of dilute nitric acid (gtt. j, mucilage water f℥j). Cicatricial bands should be incised and stretched; the vaginal walls should be incised to diminish traction

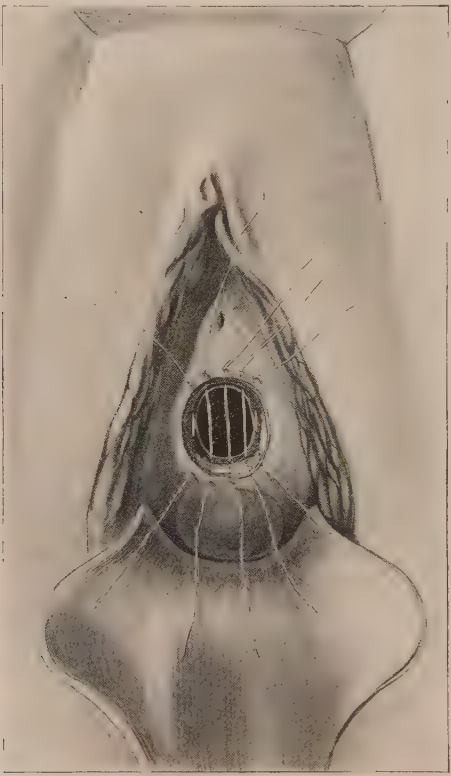


FIG. 220.—Sutures Introduced.

upon the edges of the fistula when sutured. The cicatrization may be overcome by having the incisions heal while a Gariel pessary or a colpeurynter is worn. Bozeman employed vaginal obturators of plated copper, which, when worn, distended the vagina and gave more room for operation. The intestinal canal should be thoroughly evacuated.

211. Vesicovaginal Fistula. Injuries of the vesicovaginal septum occur more frequently undoubtedly for the reason that its tissues are in a situation to be caught more readily between the advancing head and the pubic symphysis. The operation of vivifying and suturing the edges was revived, perfected, and rendered successful by Sims. After thorough cleansing and disinfection of the vagina and the bladder the patient is placed either in the semi-prone position, or on her back with the limbs well flexed. Occasionally the fistula may be rendered more accessible by having her lie upon the abdomen with the pelvis elevated. The perineum is retracted and the edges of the opening are rendered tense by suitably applied double tenacula, which are held by assistants. The denudation is performed with knife or scissors, preferably the latter, as the tissues bleed less. The denudation is accomplished at the expense of the

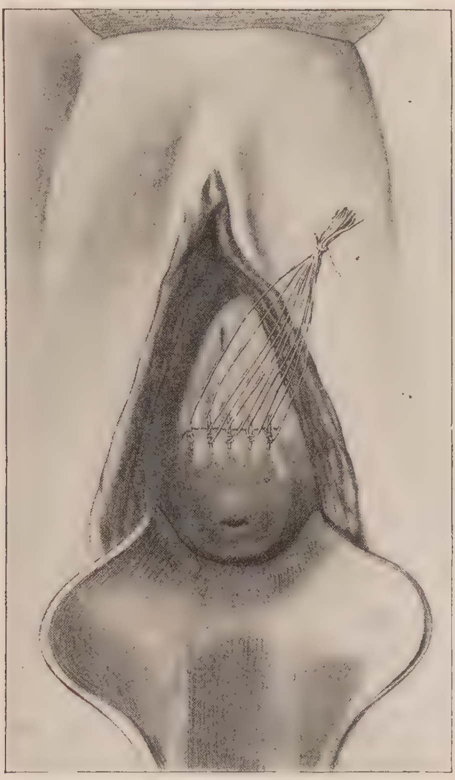


FIG. 221.—Wound Closed.

vaginal surface, exercising care to avoid injury to the vesical mucous membrane. The mucous membrane is seized with forceps at one side and the denudation is performed with the attempt to complete the circuit with the one strip. Having secured an equal denudation upon all sides, about one centimeter in width, the sutures are introduced. They are inserted about one centimeter apart, introducing and bringing them out about five millimeters from the edges of the denudation without permitting any suture to penetrate the vesical mucous membrane. The sutures may be introduced so as to close the fistula on an anteroposterior, transverse, X or Y shaped line or lines, according to the opening, that direction being chosen which will produce the least traction on the tissues. The sutures may be of silk, catgut, silkworm gut, or silver wire. The last two are preferable in denudation operations. After the sutures are all in place the bladder should be irrigated in order to remove all clots, and the sutures should be tied, twisted, or secured with perforated shot, exercising care not to draw them so tight as to strangulate the tissue enclosed.

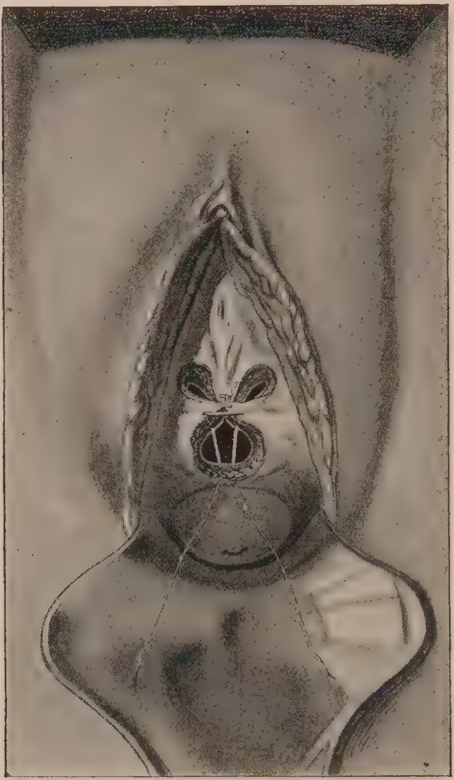


FIG. 222.—Method of Suturing to Decrease the Tension upon the Sutures.

After the fistula is closed, it is well to inject the bladder to make sure that no small opening remains. In large fistulæ, care must be taken not to injure or constrict the orifice of a ureter. If they open at the margin of the fistula, the orifice of the ureter should be enlarged on the vesical side several days prior to the operation and dilated by frequent passage of a probe.

212. **Flap Splitting or Flap Sliding.** The loss of structure by denudation in large fistulæ is not infrequently a serious sacrifice of tissue, and has led to the practice of securing fresh surfaces by splitting the edges of the fistula. The vesical and vaginal surfaces are divided through the cicatrized margin to any required depth, according to the size of the fistula. When the opening is small, it can be closed by a purse-string suture. The suture of silkworm gut or silver wire is passed through the vaginal flap within the vesicovaginal septum, and brought out in the vagina directly opposite its point of entrance, reintroduced near its exit, and made to traverse the remaining side of the opening, and brought out near the original entrance. This suture, tied, turns the vaginal flap outward and the vesical inward. When the size of the opening renders it desirable to

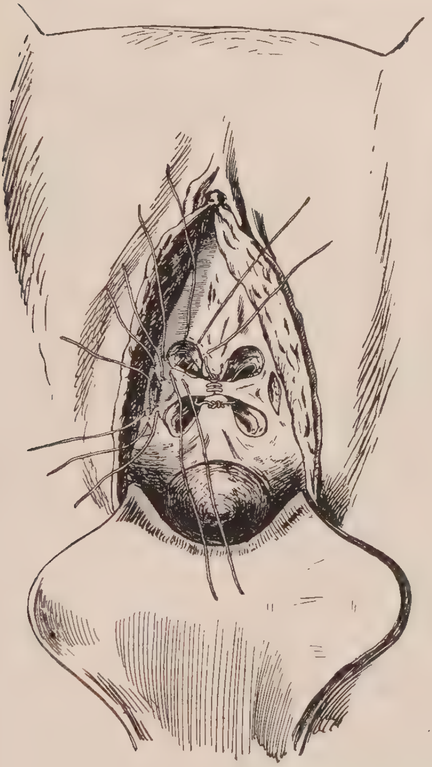


FIG. 223.—Showing Continuation of Suturing to Close Fistula with Incisions to Decrease Tension with Suture Introduced on Left Side to Close the Secondary Opening.

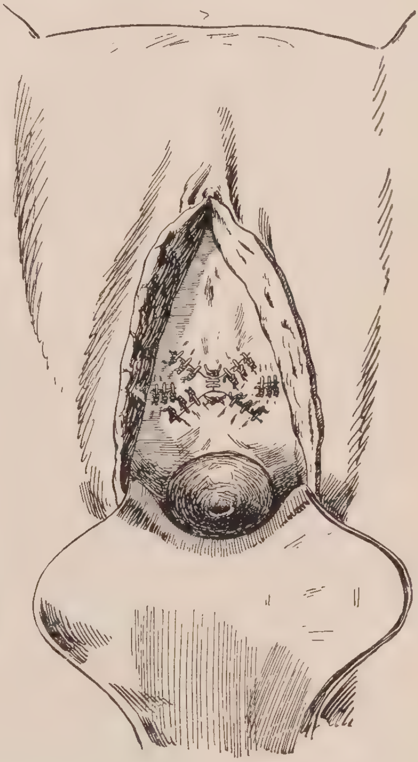


FIG. 224.—Wound Closed.

close it upon a line, the vesical flaps are closed with animal sutures, preferably chromic catgut. The vaginal flaps may be closed with silk, silkworm gut, or chromic catgut.

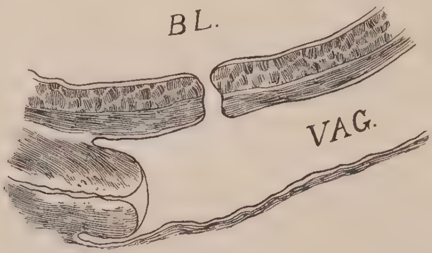


FIG. 225.—Fistula Preparatory to Splitting into Vesical and Vaginal Flaps.

Walcher advocates first cutting away the cicatricial tissue, then separating the vaginal and vesical surfaces. This procedure secures greater mobility of the internal flaps, which are closed with catgut by the Lauenstein stitch. The needle is introduced on the raw surface and brought out on the line of demarcation, midway between the raw surface and the vesical mucous membrane, and the reverse in the opposing vesical flap.

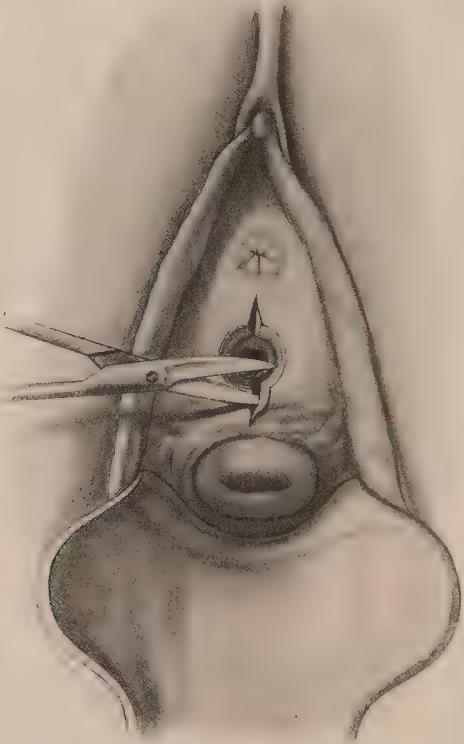


FIG. 226.—Demonstration of Flap-splitting.

After these sutures are tied, closing the bladder, the vaginal flaps are sutured. E. R. Corson (Savannah, Ga.) expedites the formation of the flaps and the introduction of sutures by the use of a portion of an india-rubber ball. A strong silk cord is passed through the shank of a shoe-button which has been made to pierce the center of a portion of a rubber ball; this, folded, is carried by forceps through the fistulous opening. Traction upon the string draws down the opening, exposing its edges. The ease with which the vaginal and vesical portions of the septum can be separated renders flap-splitting a ready method for closing large fistulæ. This separation can be done with impunity, because the circulation of the two surfaces is not interdependent. The incision through the vaginal portion is preferably made upon a vertical line. Beginning at one side of the fistula, one blade of a suitably curved scissors is inserted between the two layers as exposed by the vertical incision (Fig. 225) and carried completely around the fistulous opening, and the walls are separated by blunt dissection. The dissection may be made with the knife, first by a vertical incision through the fistula and then dissecting up a large flap on either side. When necessary to secure additional tissues to close the opening, the separation may extend to and even through the peritoneum. In closing a large fistula the sutures in the vesical wall are introduced, preferably upon a transverse line. As they are buried they should be of chromic catgut or fine silk. The edges of the fistula should be inverted into the bladder. Each extremity should be secured by a suture, the end of

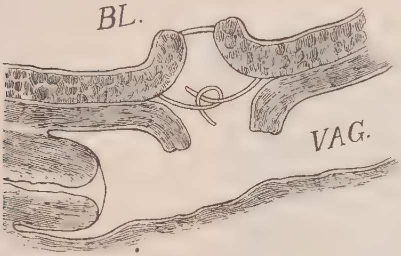


FIG. 227.—Suture Introduced into Vesical Flap.

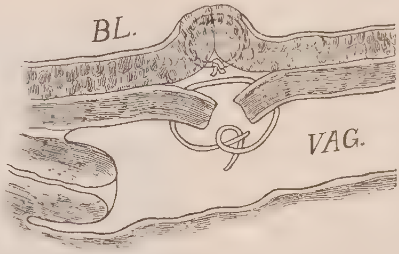


FIG. 228.—Suture Tied in Vesical Flap Introduced in Vagina.

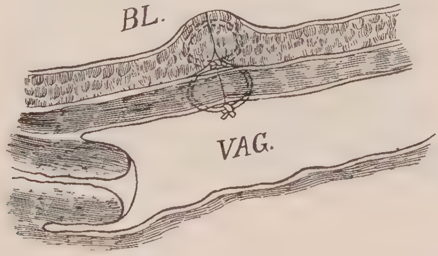


FIG. 229.—Wound Closed.

which, left long and used as a tractor, permits the intervening sutures to be introduced rapidly, after which each may be tied. These sutures should not pierce the epithelial surface of the vesical mucous membrane. The closure of the vesical wall should be followed by distention of the bladder with a warm saline solution to make sure that it is tight. The vaginal wall should then be closed by a vertical line of suturing, which may be continuous or interrupted, as the operator prefers. In introducing these sutures the bladder surface should be included, to prevent the accumulation of serum or blood between the surfaces.

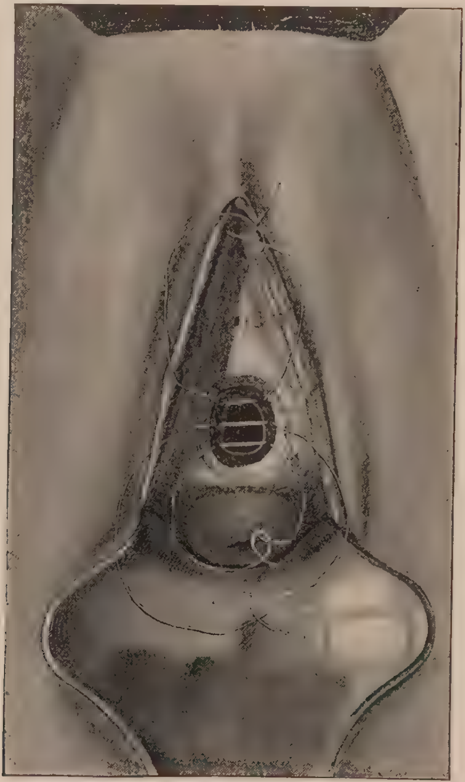


FIG. 230.—Sutures Introduced to Close Vesical Surface, as Suggested by Walcher.

The fact that the vagina has been so destroyed that it will not afford material to cover the vesical wall need not deter the operator from employing this method, as flaps can be taken from the labia or from the inner side of the thighs to complete the vaginal wall.

M. C. McGannon, of Nashville, ingeniously closed a fistula in a woman who had a laceration of the rectovaginal septum half-way to the cervix. The anterior vaginal wall and base of the bladder were gone. He dissected the bladder away from the uterus and pushed the peritoneum off until he could bring the flap down to the lower segment, and closed it with fine catgut. After closing the bladder, the surface was covered as much as possible with the remaining portion of the vagina. A large surface was left uncovered for cicatrization. The left ureter had been included in the bladder, but the orifice of the right was situated so high in the vagina that it was inaccessible. Subsequently it was conducted to the bladder by an artificially constructed conduit. A year later her condition was good, with perfect control of the urine.

In extensive fistulæ Trendelenburg advocates making a transverse incision ten centimeters long through the abdominal walls, and a transverse incision through the bladder, just below the peritoneal junction. The upper edge of the vesical wound is temporarily stitched to the corresponding abdominal, and the lower edges of the bladder are held open with sutures. The edges of the fistula are trimmed and the sutures so introduced that their ends can be brought out and tied from the vagina. The anterior vesical wound is closed around a drainage-tube, gauze is placed in the prevesical space, and both are brought through an opening in the abdominal wound, the remaining portion of which is closed with sutures.

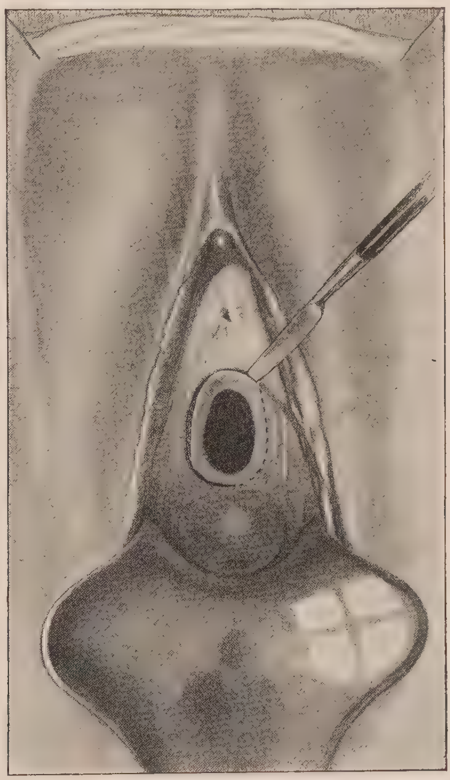


FIG. 231.—Flap-formation as Suggested by Ferguson.

Bardenheuer formed a flap by transplantation. He performed suprapubic cystotomy, and through the abdominal wound dissected the bladder away from the peritoneum as low as the fistula, separated the adhesions and cicatricial tissue, denuded the edges of the fistula and sutured them from the vagina, while the edges of the fistula were pressed together by the finger passed into the bladder through the suprapubic wound. The abdominal wound is plugged with gauze and left open. By utilizing a vesical flap the operation can be performed through the vagina, as described above.

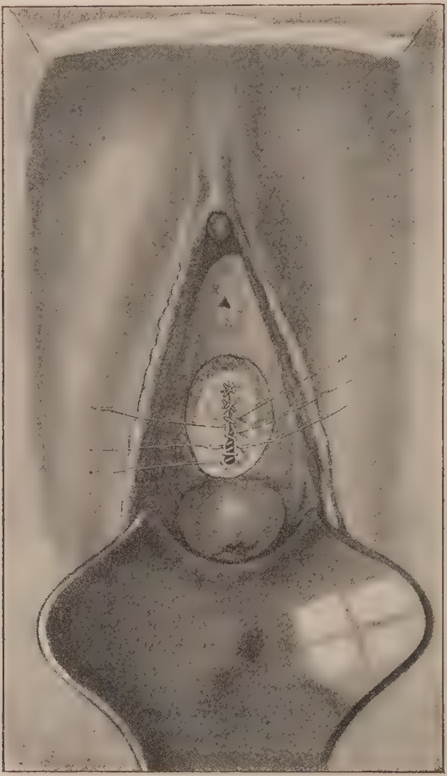


FIG. 232.—Flap Turned in and Vesical Opening Closed.

213. Flap formation is a procedure practised by Ferguson, of Chicago, and E. Stanmore Bishop, of Manchester, England. Ferguson made an incision with a scalpel through the vaginal mucous membrane three to six millimeters from the margin of the fistula. (Fig. 231.) This incision completely encircled the opening and extended to the vesical wall, but did not injure it.

The wound was kept free from blood by a stream of sterilized water. This procedure formed a circumferential flap, hinged by the vesical mucous membrane, which, turned into the bladder, formed a roof for the raw surface and was held in that position by a continuous fine chromic catgut suture so inserted that it did not pierce the mucous wall of the organ. (Fig. 232.) The narrow strip of vaginal tissue, which from its density retained the stitches well, became a part of the bladder-wall. Thus the fistulous opening was closed and made water-tight. The operation was completed by suturing the vaginal walls with silkworm gut or preferably silver wire. (Fig. 233.) Bishop ingeniously inserts four sutures into the edges of the flap as constructed by Ferguson, and with a pair of forceps passed through the urethra drags these sutures, previously knotted, out through that canal. The funnel thus formed is closed with a suture from the vagina and the vaginal walls are sutured over it. The advantages justly claimed for this plan are: first, there is no loss of tissue; second, a broad surface is secured for apposition; third, there is a projection into the bladder at the site of the opening which decreases the danger of leakage and infection; fourth, in case the ureter opens into the fistula, it affords an excellent opportunity to turn it into the bladder; fifth, it decreases the danger of primary and secondary hemorrhages; sixth, in large openings it affords the best opportunity to secure relaxation by incision or sliding flaps; seventh, it is applicable to fistulæ of the bladder, urethra, or rectum.

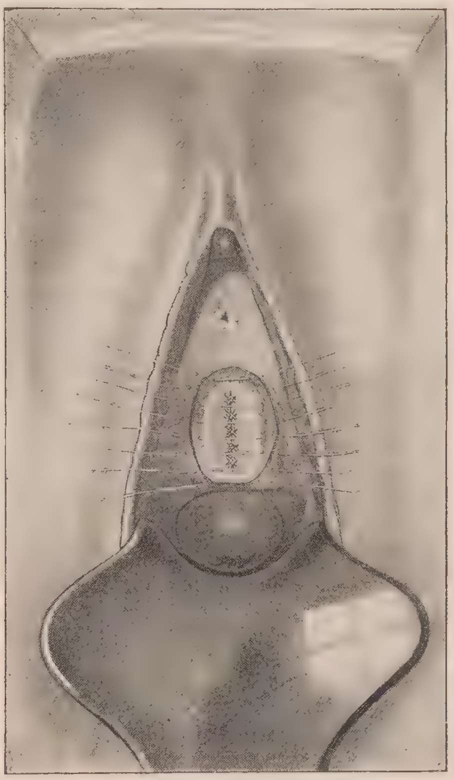


FIG. 233.—Introduction of Vaginal Sutures.

After-treatment. The vagina, thoroughly cleansed, should be packed lightly with iodoform gauze, which should remain for two or three days. Continuous drainage should be secured by the introduction of a self-retaining catheter into the bladder. This should be removed daily, for the purpose of cleansing. At the end of eight days it should be removed permanently; but the patient should be catheterized four times daily for the next week. The vagina should be irrigated with an antiseptic solution twice daily after the third day, and this should be continued

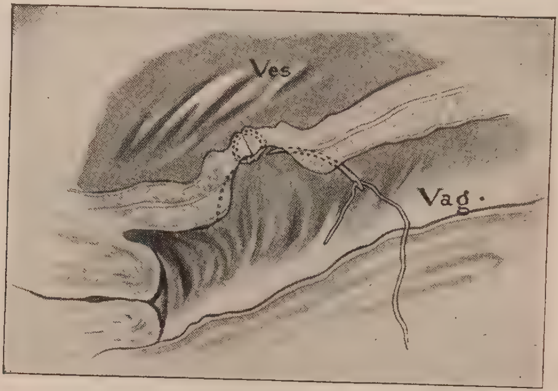


FIG. 234.—Section Showing Projection upon Vesical Surface.

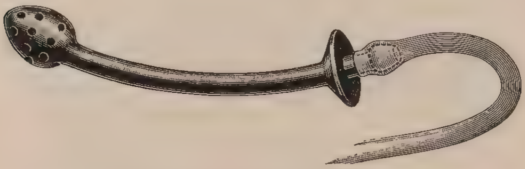


FIG. 235.—Self-retaining Catheter.

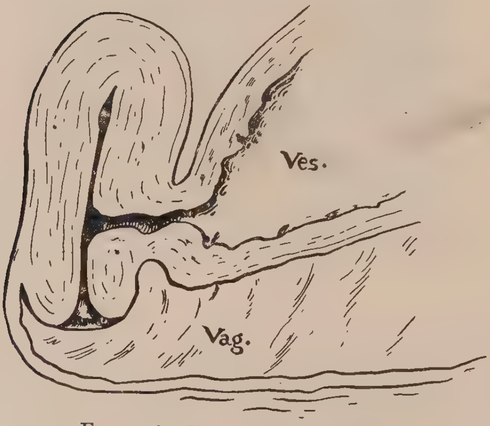


FIG. 236.—Vesico-uterine Fistula.

for the greater part of three weeks. The sutures should be removed on the fifteenth day.

214. Closure of the Vagina. Colpocleisis. Episiostenosis. Large fistulæ in which the base of the bladder is destroyed may be indirectly obliterated by closure of the vaginal orifice, thus making the vagina a part of the urinary reservoir. A ring of tissue two centimeters broad is removed from the vaginal orifice. In the dissection the parts should be kept on the stretch and the tissue should be dissected from above downward. A sound in the urethra and a finger of an assistant in the rectum will greatly facilitate the denudation of the anterior and posterior walls of the vagina. The sutures should be passed from below upward and from above downward, exercising the greatest care that neither rectum, bladder, nor peritoneum shall be perforated by the sutures. The denuded surfaces should be brought in accurate apposition and the overlapping of freshened surface with mucous membrane or skin should be strictly avoided. This procedure, while it affords a means of relieving incontinence of urine in otherwise desperate cases, has many disadvantages. Impregnation is no longer possible; coition can be practised only

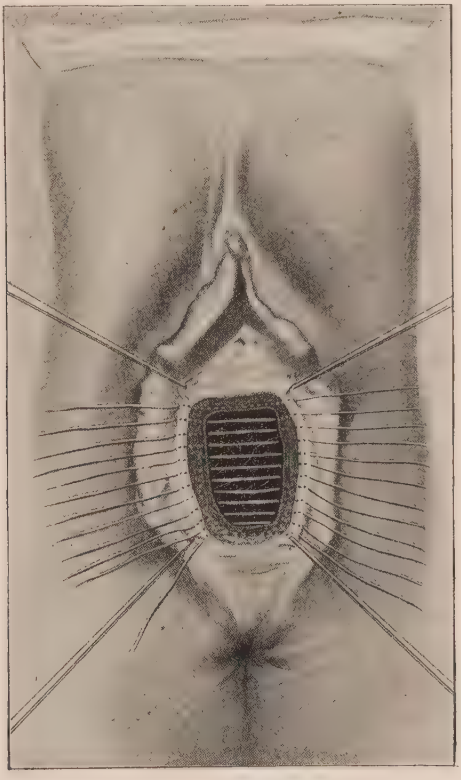


FIG. 237.—Colpocleisis.

when obliteration has occurred high in the vagina. The menstrual blood not infrequently excites violent cystitis resulting in pyelonephrosis and the formation of vesical calculi. The urine may cause metritis or tubal, ovarian, and even peritoneal inflammation. Rectovaginal fistula has been made to supplement this operation when the neck of the bladder has undergone such injury as to render the patient unable to retain the urine. The majority of such cases have been unsuccessful, owing to the irritation of gas and feces and the inclination of the fistula to close. The fistula which cannot be closed by flap-sliding is very rare, as the vesical and vaginal surfaces are separated easily and the vaginal wall when deficient can be replaced by flaps from the vulva and inner sides of the thigh.

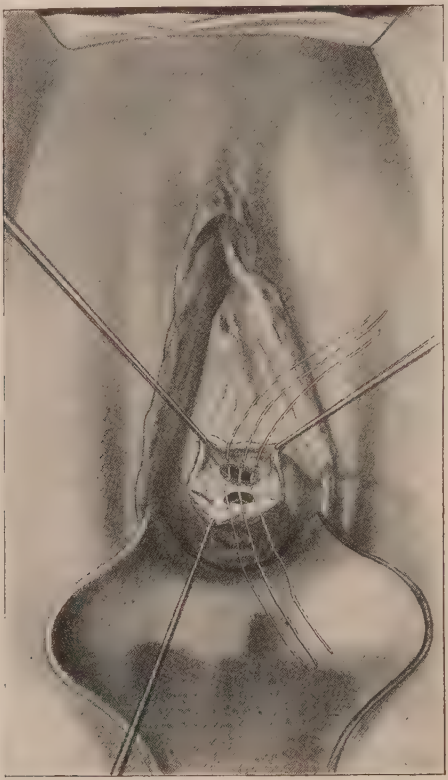


FIG. 238.—Closure of Fistula after Its Exposure by Incision through Anterior Vaginal Fornix.

215. Urethrovaginal fistula is very infrequent. It is characterized by the discharge of urine into the vagina during micturition. The flap-splitting operation affords the most satisfactory method of closing it.

216. Vesico-uterine fistula permits the escape of urine through the external os. It may result from a slough following a tedious labor, and from lacerations of the cervix when the tear has extended through the anterior lip. The tear may have been incomplete, not extending through the os, or the fissure may have healed with the exception of the communication between the bladder and cervix. The only condition with which such a fistula can be confused is the uretero-uterine. The latter fistula is rare. Upon injecting the bladder with a colored fluid (a solution of pyoktanin) its emergence from the os demonstrates the presence of a vesical fistula; the continuance of clear fluid, a ureteral fistula. In an opening of considerable size the sound will pass directly into the bladder, where it can be recognized by another inserted through the urethra.

Treatment. The fistula may be exposed by dilating the cervix with a laminaria tent. In a uretero-uterine fistula this procedure would be accompanied by renal pain, nausea, and vomiting, due to the obstruction of urine from the kidney corresponding to the affected ureter. The fistula may be denuded and closed from the cervical canal, but the operation is attended with difficulty. The preferable procedure is to cut through the anterior fornix of the vagina and dissect the bladder from the cervix, when the opening can be exposed and sutured. The vaginal wound is subsequently closed with silk or catgut. It is desirable that the peritoneum should not be opened, though its incision, with proper precautions, does not materially affect the result. When the bladder-wall is thin, Herr advises cutting through the cervix and reinforcing the bladder-wall with cervical tissue. Sänger split the cervix of a patient in whom the sinus opened laterally, sutured the side on which the fistula occurred, as in an Emmet operation, and then sutured the other side.

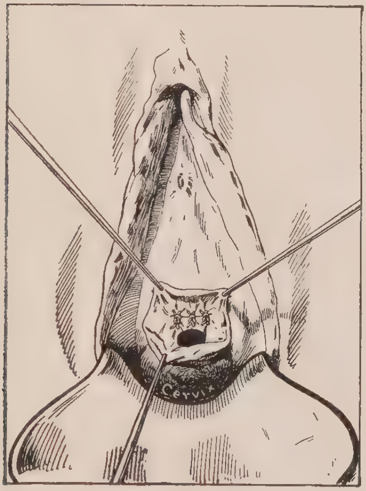


FIG. 239.—Fistula Closed into Vagina. Uterine Opening Remains, Which Will Close Itself.

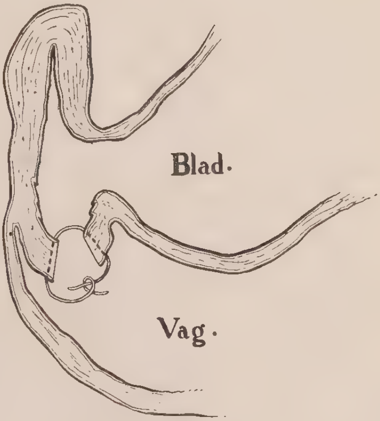


FIG. 240.—Section Showing Suture for Hysterocleisis.

217. Hysterostenosis or hysterocleisis (Fig. 242), the denudation and suturing of the cervix, is possible, but the menstrual flow may produce serious cystitis, and contraction of the fistula may result in severe pain and distress during menstruation. Both tracts will be subject to irritation and ascending infection, producing upon the genital side endometritis, salpingitis, and peritonitis; upon the urinary, ureteritis and pyelitis. When we consider that the opening can be exposed by dissecting the bladder from the cervix, one can hardly conceive the selection of hysterocleisis as ever justifiable.

218. Vesico-uterovaginal (Cervical) Fistula. A portion of the cervix, with a considerable portion of the vaginal septum, may be destroyed, and the remaining walls may be so thin as to render its closure difficult or dangerous, owing to proximity of the peritoneum. In such cases the anterior lip of the cervix (Fig. 243) may be denuded and turned into the bladder, using it as a plug to fill up the opening.

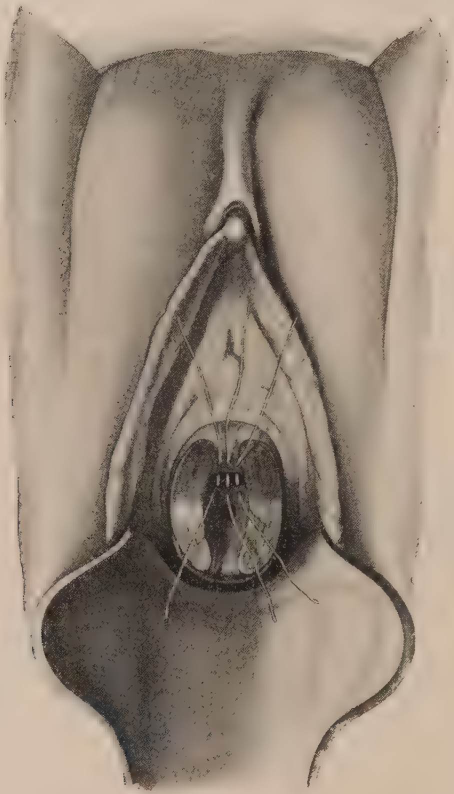


FIG. 241.—Closure of Fistula within Cervical Canal after Splitting Cervix.

When the fistula has developed at the expense of the anterior cervical lip to such an extent that it will not afford sufficient structure to close the opening, the posterior lip may be freshened and utilized. (Fig. 244.) This procedure necessarily produces disturbance because of the continuance of menstruation. A preferable method is to separate the vesical wall from the cervix and secure sliding flaps, which can be closed as in figure 245.

219. Ureterovaginal-ureterocervical Fistulæ. Lesions of the ureter are less frequent than the other forms of fistulæ. Participation of the ureter in the vesicovaginal opening is much more frequent. Ureterovaginal fistulæ are more frequently the result of injuries sustained during the performance of hysterectomy. The *diagnosis* has been considered. (See Section 284.) The cervical fistula is very rare. The thickened ureter can be traced generally to the cervix by the finger in the vagina.

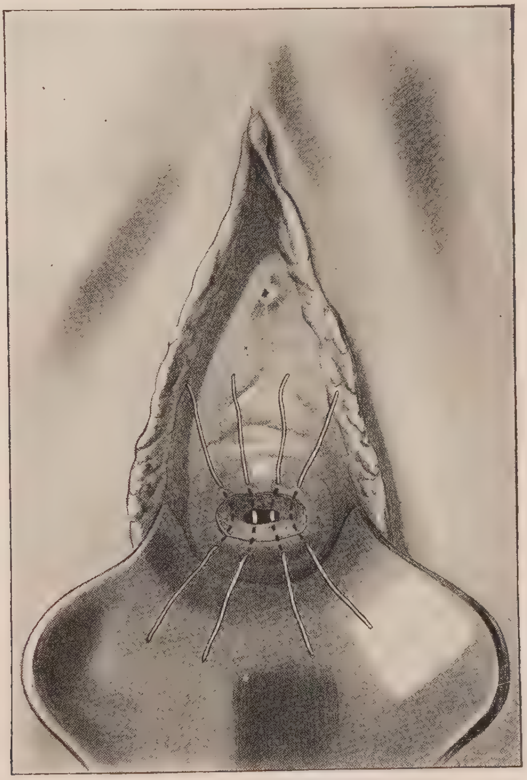


Fig. 242.—Hysterocleisis.

Relief from the discomfort produced by these fistulæ may be accomplished by resort to one of several methods.

1. The formation of a flap from the anterior vaginal and posterior vesical septum which is united to a denuded surface on the posterior vaginal wall.
2. The formation of a vesico-vaginal fistula and such denudation and suturing as will convey the urine into the bladder.
3. Anastomosis through the vagina.
4. Anastomosis through the abdomen.

5. Ligation of the ureter.
6. Introduction of the ureter into the rectum or colon.
7. Drainage of the kidney through the back, or the establishment of a fistula in the lumbar region where a receptacle may be worn conveniently.
8. Nephrectomy.

1. The first method of dealing with ureterovaginal fistulæ has to do with cases in which the lesion had occurred when hysterectomy was performed. The uterus having been removed, the only inconvenience from the procedure will be a slight shortening of the vagina. The procedure suggested by Werder is performed as follows: A bougie, inserted into the bladder through the urethra, impinges against the posterior vesical wall near the upper part of the vagina. On this landmark, a transverse incision is made through the vaginal septum with curved scissors or an angular bistoury. The upper end of the vagina having been encircled by an incision and the edges separated, the lower lip of the transverse incision is sutured to the vagina to throw the undenuded portion of the vaginal wall into the bladder. Silkworm gut sutures are preferable for this purpose and should not enter any portion of the mucous membrane which will form a part of the vesical cavity.

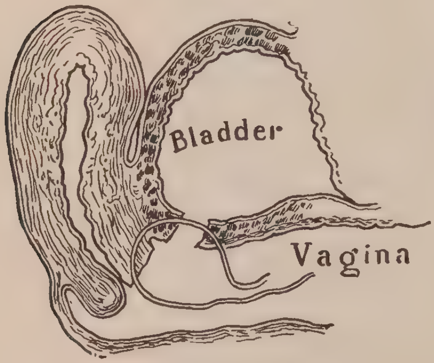


FIG. 243.—Anterior Lip of Cervix Utilized to Close the Fistula.

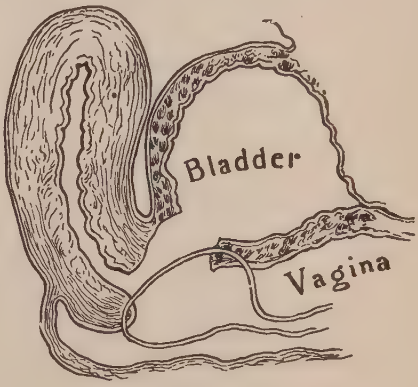


FIG. 244.—Vesico-uterovaginal Fistula in which the Posterior Lip of the Uterus is Utilized to Close the Opening.

2. The second method involves principles suggested by Simon of London. It is used when the fistula affects one ureter and a functionating uterus remains. The first step consists in establishing a vesicovaginal fistula near the opening of the ureter into the vagina. To ensure permanence, the vesical and vaginal mucosa must be united by sutures and the permanence of the fistula assured before attempting to control the incontinence. Ten days to two weeks after the establishment of a fistula, an incision is made around the two openings and the upper edges sutured without permitting any of the sutures to enter or come out on the mucous membrane. These tissues sutured, a conduit lined with mucous membrane is formed which conveys the urine from the severed

ureter into the bladder and the raw surface below is covered by a vaginal flap.

3. Vaginal anastomosis, as an alternative, takes cognizance of the ureter as a distinct canal capable of being dissected from its bed and drawn sufficiently to permit of its traction into an opening made into the bladder where it is secured by sutures. This procedure is applicable to either vaginal or cervical fistulæ of this canal. In order to prevent compression of the ureter a portion of the bladder-wall should be excised. The ureter is introduced into the bladder, the wound is closed carefully with sutures introduced to fix the wall of the ureter and thus insure its retention. Care should be exercised that the ureter is not compressed, nor much, if any, of its surface left uncovered in the vagina. In ureterocervical fistulæ the cervix should be split until the orifice of the ureter is exposed, when that structure can be drawn down and union accomplished in the manner just described. Obliteration of the vaginal orifice has been done after the establishment of a vesicovaginal fistula, but such a course is both unnecessary and undesirable.

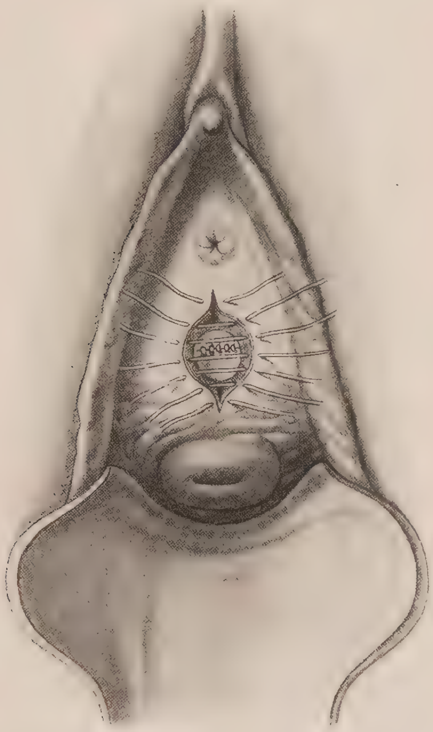


FIG. 245.—Vesical Wall Loosened and Sutured. Vaginal Wall Sutured in Opposite Direction.

The difficulty of dissection of the ureter in a vagina more or less narrowed by cicatricial contraction, and the possible destruction of a part of the ureter as a result of the injury, necessarily limits the feasibility of this procedure.

4. Anastomosis through the abdomen may be preferable in such cases, or when the lower extremity has undergone inflammatory changes or is so embedded in exudation that it cannot be brought down readily. Through the ordinary incision for abdominal section the intestines are drawn aside, exposing the line of the ureter. In ureterovaginal fistula its situation can be recognized more readily by the introduction of a catheter prior to the abdominal incision. The peritoneum is opened, the ureter is raised, its proximal portion is tied and dropped back. The central end is introduced through an incision into the bladder and secured by sutures, as in the vaginal method. The anastomosis with the bladder should be on the corresponding side of the pelvis, and with as little tension upon the canal as possible. Should the ureter be so short as to cause tension in reaching the bladder, the latter should be drawn up and anchored by a few stitches to the side of the pelvis, so that no traction shall be made upon the ureter. In recent injury an anastomosis can sometimes be made between the divided ends of the ureter. The proximal end should be introduced into the distal one and secured by sutures. (Fig. 251.) The ureter may be tied with a double ligature and dropped back. The urine accumulates in the pelvis of the kidney until the pressure equals that of the blood, when secretion ceases. The ureter should pass through the bowel obliquely. However, this procedure is very likely to be followed by serious conditions in both the urinary tract and the intestine. In the former, infection and suppuration of the pelvis of the kidney are prone to follow. The presence of urine frequently causes irritation and inflammation (colitis or proctitis) of the intestine.

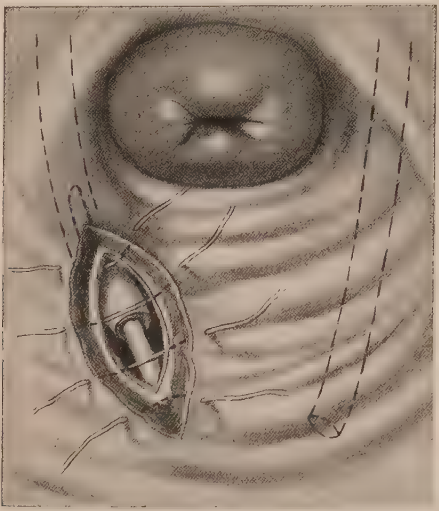


FIG. 246.—Operation for Ureterovaginal Fistula.

5. Ligation of the ureter is done if anastomosis of the ends of the ureter or the insertion of the proximal end into the bladder is not feasible.

6. The divided ureter is introduced into the ascending colon on the right, or into the sigmoid on the left.

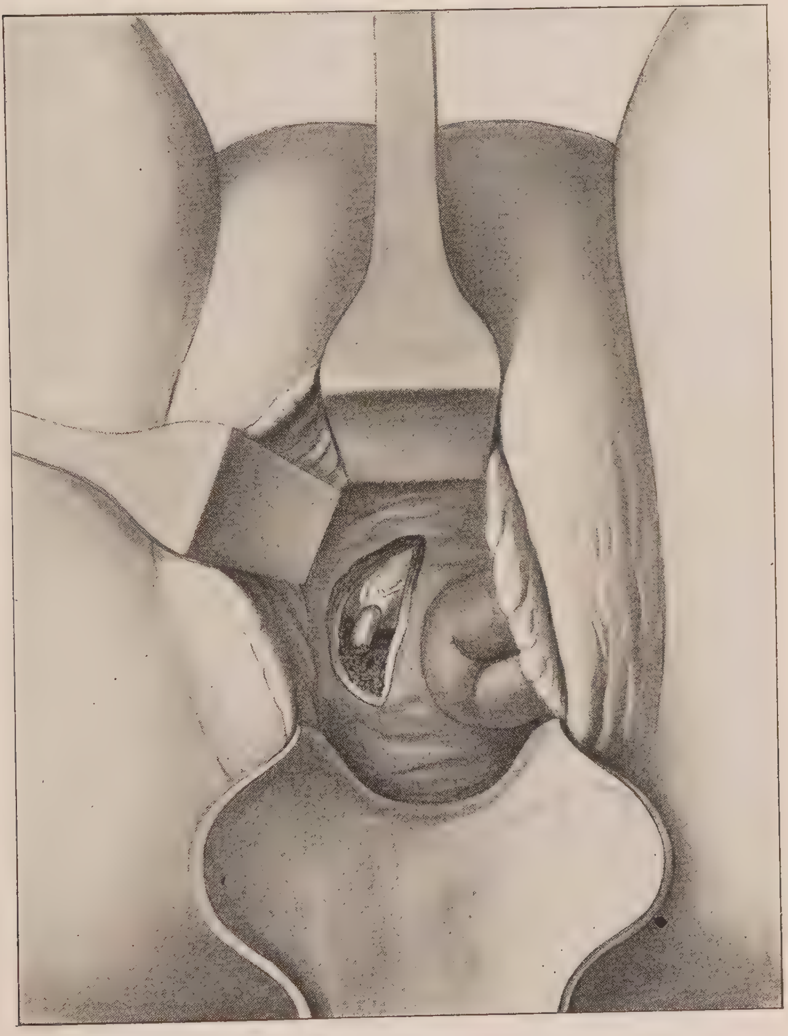


FIG. 247.—Vaginal Implantation of the Ureter into the Bladder.

7. Drainage of the pelvis of the kidney through an incision in the back has been advocated and practised satisfactorily by Watson of Boston. One great advantage it affords is that a receptacle can be worn with less discomfort. This plan of procedure is more applicable to cases in which it is necessary to sacrifice a good portion of the bladder and the

ureters for malignant disease of the pelvic organs. The ends of the ureters can be carried out on the back in the lumbar regions and afford equal readiness for wearing a receptacle for the urine, but neither of these procedures should be elected as long as it is possible to return the divided ureters to the bladder.

8. Nephrectomy is advisable when the long duration of the fistula has resulted in extension of infection to the pelvis of the kidney, and careful examination has disclosed that the other kidney is capable of carrying on the work of both organs.

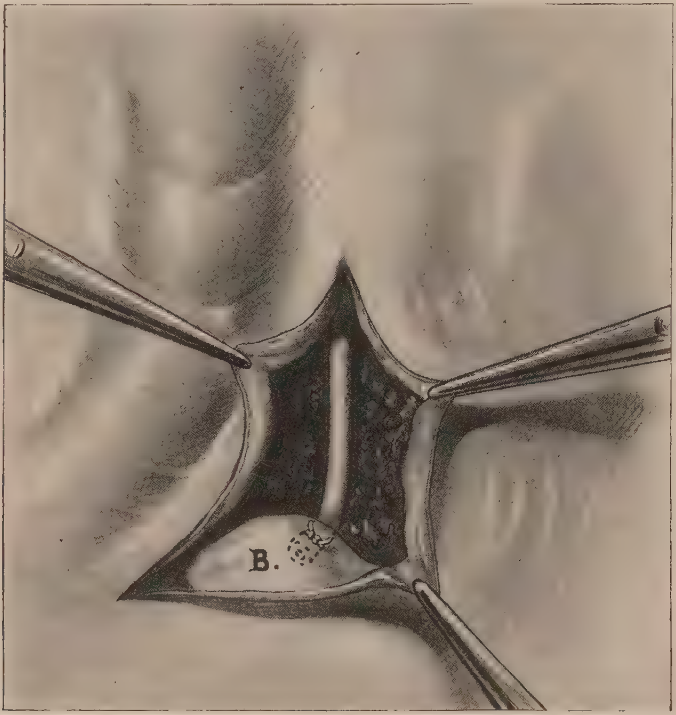


FIG. 248.—Abdominal Transplantation of Ureter for Ureterovaginal Fistula. B. Bladder.

220. Accidents of the Operation and Results. *Primary hemorrhage* of a serious character may result from an unusually large uterine artery, from vascular walls, or from injury of the vesical mucous membrane. Either compression or suture is the best means for its control, but its occurrence imperils the result of the operation.

Secondary hemorrhage may take place between the third and fifth days, and should be controlled by the tampon. It may occur into the bladder, and may be discovered only after that organ is filled with clot. It gives rise to violent tenesmus, and its decomposition will be extremely prejudicial to the success of the operation. When it cannot be removed by irrigation, inject a solution of pepsin or enzymol. If this procedure fails to afford relief, the urethra should be dilated and the clot broken up and removed with a blunt curet. If hemorrhage continues, it will be necessary to remove the sutures and search for the bleeding vessel.

Inclusion of a ureter will cause nausea, vomiting, lumbar pains, and fever. The suspected suture should be immediately removed.

Peritonitis may result from injury during the denudation or suturing, or from infection, when proper precautions have not been observed, or when there is coëxisting pyelitis or cystitis.

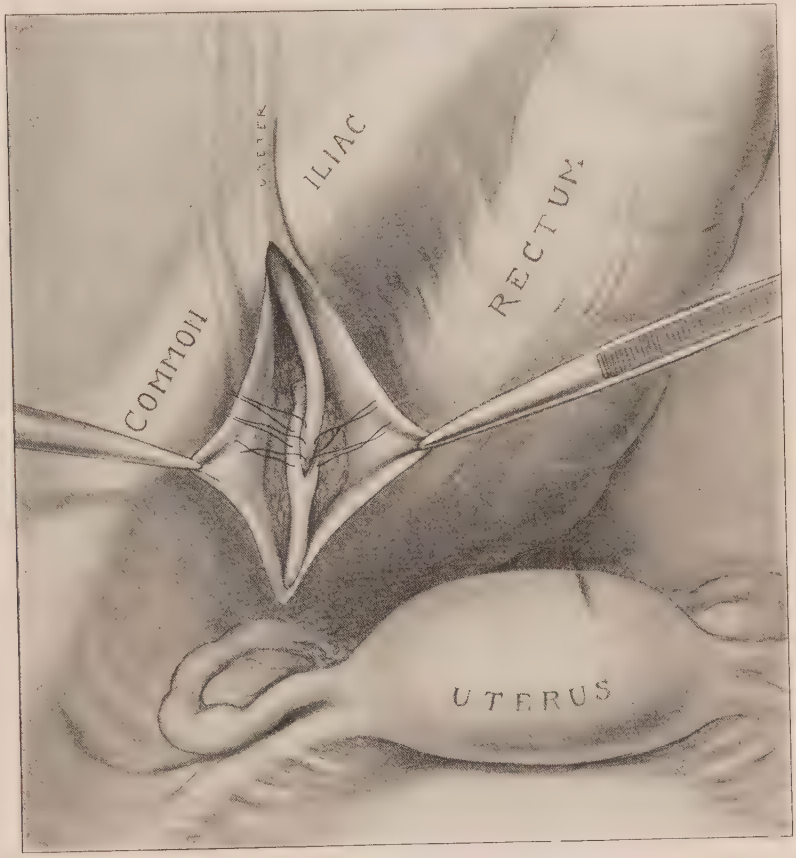


FIG. 249.—Ureteral Anastomosis.

Calculi and calcareous concretions have formed upon silver wire, silk, or even catgut sutures.

The results of the operation are generally most satisfactory. Death is of very infrequent occurrence.

221. Rectovaginal Fistula. The methods of treatment suggested (Section 210) are equally applicable to the fecal fistulæ. The last two methods, flap-splitting and flap-formation, are probably more effective and generally applicable in the great majority.

In a small fistula a curvilinear or triangular trap-door may be raised, including the fistulous orifice; the opening in the rectal wall is closed by very fine (eye) silk, which has been sterilized previously, or by chromicized catgut. One or several Lauenstein sutures may be used, care being taken not to enter the rectum. The vaginal flap is then secured with silkworm-gut sutures. In large fistulæ a sagittal incision with lateral flaps is most satisfactory. The sutures are introduced as previously described. Flap-formation is very serviceable in closing rectal fistulæ of considerable size; flap-transplantation is rarely successful.

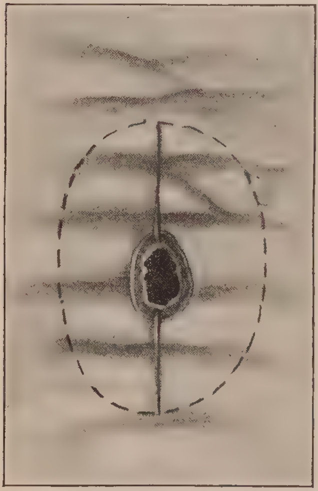


FIG. 250.—Sagittal Incision for Recto-vaginal Fistula.

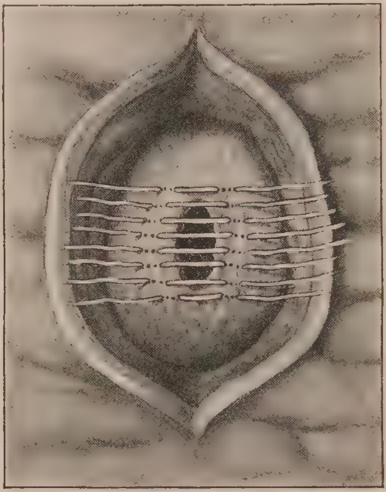


FIG. 251.—Lauenstein Suture in Recto-vaginal Fistula through Rectal Wall.

222. An anovulvar fistula can be closed from the vagina or perineum. Such a fistula is incised through its track, cureted, and the entire sinus closed by sutures. It is generally better to extend the incision to, but not through, the sphincter, and to close the rectal or anal surface with sutures from the perineal side, when failure to unite will not endanger the future value of the sphincter and will enable the operator to secure union by granulation through gauze packing. Small fistulæ near the vulvar outlet can be closed as a part of the operation of perineorrhaphy.

Preliminary and After-treatment. The bowels should be evacuated thoroughly by repeated purging for two or three days. During the same period vaginal douches should be given, and a thorough scrubbing of the vagina with a solution of creolin and soap should immediately precede the operation. However, no operative procedure for closing a fistula should be entered upon until careful rectal examination has demonstrated the absence of a possible rectal stricture as its cause. For several days prior to the operation, and for at least a week subsequently, the patient should be kept upon an animal broth diet, and the use of milk should be prohibited. The operation should be preceded a few hours by thorough irrigation of the rectum, and continuous irrigation should be practised during it. After the third day the bowels should be moved each alternate day. The sutures of silk should be removed upon the eighth day; silkworm gut or silver wire may be permitted to remain for fifteen days. The patient should be confined to bed the greater part of three weeks, and the bowels should not be permitted to become constipated for a month.

223. **Enterovaginal fistulæ** have been cured by cauterization, or by denudation and suture from the vagina. The readiness with which it closes depends on the easy passage of the intestinal contents along the intestine beyond the opening. Ordinarily the intestine is more or less constricted by adhesions so that it is a safer plan to treat such fistulæ by opening the abdomen, separating the adhesions, and closing the opening. The opening in the vaginal wall will close itself.

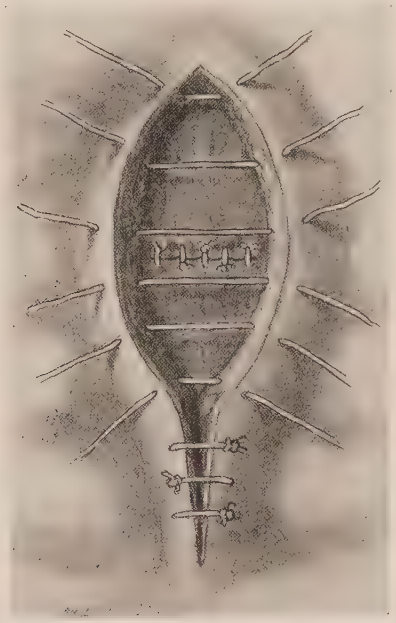


FIG. 252.—Rectal Wall Closed by Transverse Line of Sutures; Vaginal, by Vertical Line of Sutures.

224. **Cervicovaginal Fistula.** A cervicovaginal fistula is one which arises as a result of rupture of the cervix during labor, from a longitudinal tear the lower margins of which have become reunited. The tear may be a perforation of one lip of the cervix through which the fetus is extruded, and occurs where the cervix is hard, rigid, and unyielding. Such a condition of the cervix sometimes causes the entire cervix to be torn away. A fistula may also arise from faulty methods of repair of the lacerated cervix. I have seen such openings on both sides of the cervix where trachelorrhaphy has been attempted. The fistula doubtless sometimes

arises from the use of sharp instruments in attempts at abortion. The opening of such a fistula is excoriated and filled with mucus.

Treatment. The correction of the condition is not always an easy procedure. The preferable plan is to incise the cervix through the opening, denude the margins, and close as in an ordinary operation of trachelorrhaphy, but this is not always practicable and in some cases the amputation of the cervix may be demanded.

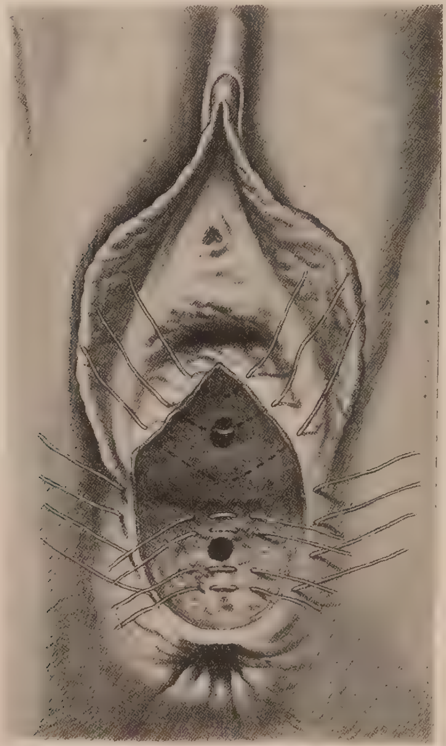


FIG. 253.—Rectovaginal Fistula Closed in Operation of Perineorrhaphy.

PERINEUM.

225. **Lacerations of the pelvic floor** are a frequent lesion of parturition, and can occur from within outward through the vagina and vaginal portion of the perineum, leaving its integumental covering intact. The injury is a separation or tearing-off of the muscular fibers from the sides of the vagina. Generally, the tear takes place through the integument of the perineum. It may extend through the entire structure, the sphincter, and up the rectovaginal septum. Not infrequently it will be found that the injury has been quite as deep, but on one side of the rectum and anus, and leaves both intact. Less frequently it will thus extend on both sides of the anus.

Naturally, the influence upon the subsequent appearance and function of the parts must vary with the extent and direction of the laceration. A slight laceration which involves only the anterior portion of the perineum may heal without producing much deformity, if any. A deeper laceration, by the action of the transversus perinei muscles, permits the vaginal orifice to stand open, and presents a triangular appearance. The failure of the bulbocavernosi muscles to antagonize the coccygeus longer permits the anus to be drawn back.

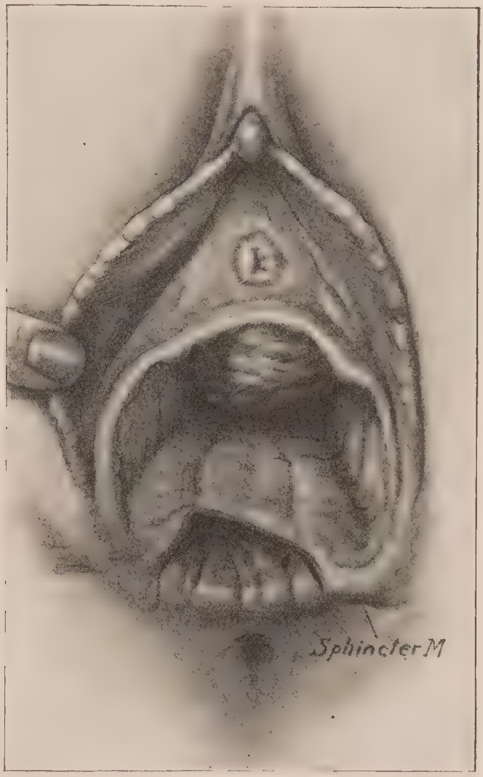


FIG. 254.—Rupture of Perineum into Rectovaginal Septum.

Laceration through the sphincter necessarily causes loss of control of the bowel-contents. (Fig. 254.)

The deep laceration to one side of the anus leaves the levator ani unantagonized, and the parts are drawn to the opposite side. When the tear extends upon both sides, the anus is depressed and drawn backward. The vulva stands open, and we can look into the vagina from three to five centimeters.

Causes. Injuries of the pelvic floor may arise, first, from conditions inherent in the mother; second, in the child; and third, in the course and management of the labor. Of the first class may be (*a*) too great or too slight an inclination of the pelvis, which renders the mechanism of the fetal head imperfect; (*b*) a small vulvar orifice with rigid muscles, or a large amount of fat in the perineum; (*c*) high or anterior situation of the vulva, making a long perineum, over which the child's head must be extended.

Second, laceration may result from excessive size of the fetal head and shoulders, or from relative disproportion to the size of the mother.

Third, laceration may result from (*a*) either too rapid or too tedious labor; (*b*) vertex presentations when rotation occurs into the hollow of the sacrum and an occipitoposterior position presents a longer diameter of the head at the outlet; (*c*) face presentations, in which the longest diameter of the fetal head presents; (*d*) either incomplete or excessive flexion; (*e*) faulty manual or instrumental interference.

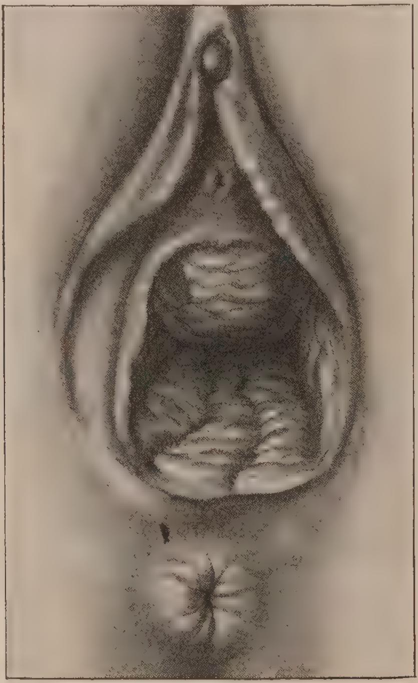


FIG. 255.—Incomplete Rupture of the Perineum.

Degree or Extent. Lacerations of the pelvic floor may be *incomplete* or *complete*, and are generally divided into four degrees: first, a tear through the fourchet and to a slight extent in the perineum; second, to the sphincter. These form the incomplete lacerations, while the complete are: third, the tear extending through the sphincter; and, fourth, up the rectovaginal septum. A rare form of laceration is the central rupture, in which the fetus passes through the perineum without tearing either the sphincter or the vulva.

The results of the injury are necessarily dependent upon its extent. The immediate effects are induced by the action of the injured or antagonistic muscles. The cicatricial tissue produces certain reflex nervous phenomena, which, however, are insignificant compared with the mental influence exerted by fecal incontinence. The laceration causes defective involution of the vagina and uterus, the defect in the muscular junction of the pelvic floor weakens the action and consequent resistance of the pelvic diaphragm. The constantly varying pressure of the bladder and rectum; the increased abdominal pressure subsequent to straining at stool; and the abnormally heavy uterus lead gradually to displacement downward of that organ; or, if it is fixed by the condition of its pelvic attachments, to extrusion of the anterior and posterior walls of the vagina; and their consequent weight will produce hypertrophic elongation of the cervix. Thus we have cystocele (prolapse of the anterior vaginal wall, and with it the bladder), rectocele (prolapsed posterior wall), partial or complete prolapse of the vagina, with elongation of the cervix, or procidentia, attending the increased weight of subinvoluted organs and the diminished support resultant from the lesion under discussion.

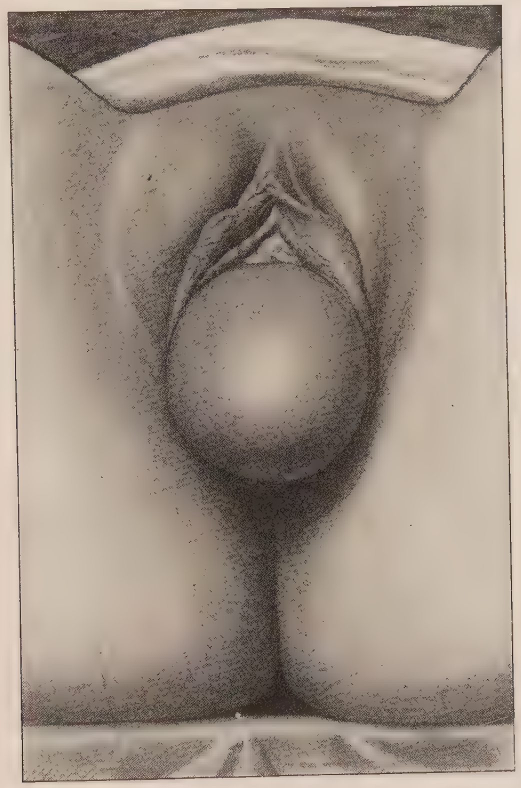


FIG. 256.—Cystocele.

Paradoxical as it may seem, the tendency to prolapsus uteri is not as marked in complete lacerations as when they are incomplete. The position of the anus and the resistance of the sphincter cause the rectum to be driven out between the levator ani muscles until considerable protrusion or rectocele occurs. The increased resistance with decreased support causes the anterior segment of the pelvic floor to project, forming a cystocele, and the traction leads either to prolapsus or to hypertrophic elongation of the cervix.

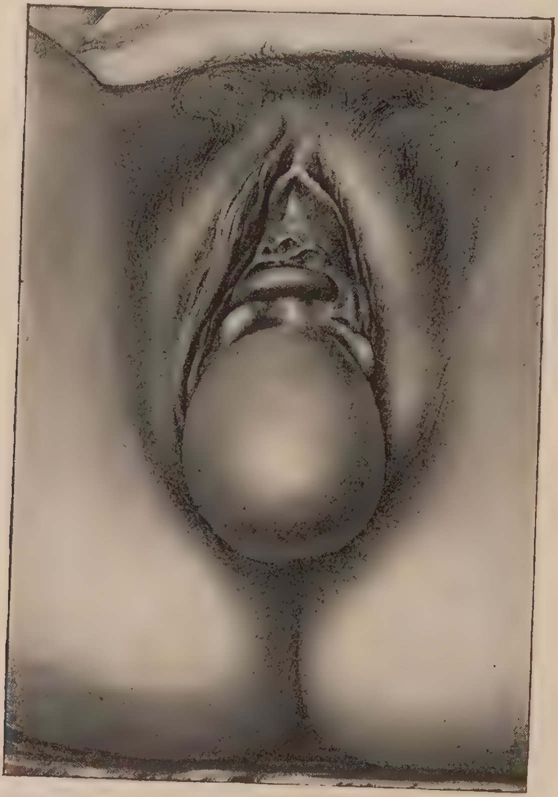


FIG. 257.—Rectocele.

Treatment. The proper course is so to repair the injury as to restore the normal condition of the pelvic floor as nearly as possible. In slight lacerations, restoration will be secured by keeping the patient quiet and the parts clean. The operative treatment may be primary, intermediate, or secondary.

By *primary operation* is understood the repair of the laceration immediately or at least within twelve hours. The tear presents a large, raw surface, and is found frequently with ragged, irregular edges. The vagina may have been torn and the soft parts pushed off until the perineum has split either through the sphincter or to one or both sides of the anus. The method of repair will depend upon the nature and extent of the lesion. The necessary instruments will be found in an ordinary pocket case—scissors, dissecting forceps, a needle-holder, and long and short curved needles. The suture material may be silkworm gut, catgut, silk, or silver wire. The patient should be placed upon her back across the bed or upon a table, while an assistant holds each leg, flexed upon the abdomen. As the parts are benumbed by the stretching to which they have been subjected an anesthetic may be omitted; but if the patient is very nervous, one should be employed. A rubber pad or a piece of mackintosh should be placed beneath the patient to prevent soiling bed and to direct the current of irrigating fluid into a receptacle upon the floor. Compress the uterus and cleanse it and the vagina of clots; cleanse the external surface with a disinfectant fluid, after having trimmed the vulvar hair in order to keep it from embarrassing the procedure. Place a pad of gauze or absorbent cotton beneath the cervix to keep the vagina free from blood. Trim smooth the ragged edges of the tear and proceed to suture. Fine chromicized catgut is preferable, because it will not have to be removed, and produces less annoyance during the care of the patient than does either silkworm gut or silver wire. In slight lacerations and vaginal tears the use of the continuous suture is satisfactory. In extensive laceration interrupted sutures offer advantages. Precautions should be exercised to leave no dead spaces in which blood may accumulate, become infected, and produce sepsis. In a double tear which extends upon both sides of the rectum the needle should be entered from above, brought out in the sulcus, reëntered, and carried upward through the vaginal mucous membrane, so that each suture lifts up the tissue. Care should be exercised to restore the position of the levator ani muscles by bringing their torn ends back in position. So far as possible the sutures should be brought out in the vagina, as they thus produce less pain. The perineal edges of the tear may be united with a continuous catgut suture including but little of the skin.

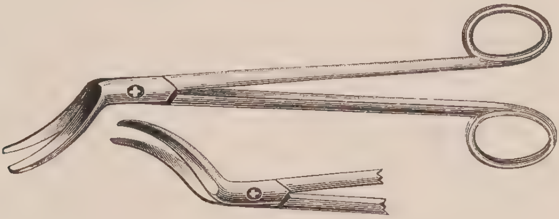


FIG. 258.—Right and Left Curved Scissors.

In laceration of the sphincter, make sure that the ends of the divided muscle are secured and coaptated by the suture. When the tear has extended into the rectovaginal septum, the sutures may be introduced and tied from the rectal side, or better, the Lauenstein suture with buried catgut may be employed.

The advantages claimed for the primary procedure are: first, if the operation is successful, the patient is spared the necessity of a subsequent operation; second, with proper precautions, she is much less likely to suffer from infection, and convalescence is expedited; third, the sequelæ of unrepaired injuries are avoided.

Contraindications. The primary operation is contraindicated when the patient has been exposed to a prolonged labor and the tissues have undergone extensive fraying or bruising through prolonged manual or instrumental interference. It is also contraindicated when there is reason to believe that the wound has been exposed to virulent infection. In all cases of severe labor and extensive laceration of the pelvic floor, especially where there is reason to believe that there has been laceration of the cervix, to some degree, I find myself in accord with those who advise deferring operative procedure for five to seven days.

The intermediate operation may be performed from twenty-four hours to ten days subsequent to labor. The delay may be occasioned by the lack of proper material or the condition of the patient who is suffering from such profound shock that it will seem unwise to resort to any immediate procedure. Moreover, in severe cases it is better to be deliberate for at the end of five to seven days the involution of the uterus has occurred to such a degree as to permit recognition of injuries to the cervix; devitalized tissues will be recognized by sloughing; and the absence of infection will be manifest. Should infection exist, this would of course delay operative procedure still longer.

The genital tract should be cleansed carefully, the raw surfaces wiped with a gauze sponge, any ragged surfaces trimmed, and the surfaces sutured as for the primary operation.

Secondary operation is preferably not performed for at least two months after delivery in order to permit involution and cicatrization to become accomplished. In preparation, particularly when the tear is complete, the bowels must be thoroughly evacuated. Castor oil, a saline or compound licorice powder should be given several days or a week before the operation and repeated at intervals of from twenty-four to forty-eight hours, in order to insure thorough evacuation of all hard, scybalous masses. The diet should consist largely of animal broth, while milk should be absolutely excluded. The evening and morning before the operation the lower bowel should be cleansed with large enemas. The last enema should be given at least three hours before the time fixed for the operation. Patients should be prepared (Section 131), and the following instruments sterilized: a scalpel; right and left curved scissors, as well as scissors curved on the flat; three double tenacula; eight pressure forceps; one long, rat-toothed dissecting forceps; a needle-holder; and two long and two short curved needles, all threaded with carriers. The suture material may be silk, silkworm gut, catgut, or silver wire. In extensive laceration I formerly used silkworm but I now prefer chromic catgut for the reason that the different structures can be sutured separately and thus cause less tension on the superficial structures. This plan greatly relieves the pain and discomfort of the operation and relieves the patient from the annoyance caused by the removal of sutures.

226. Operations on the Pelvic Floor. The aim of any operative procedure on the pelvic floor is to restore the parts to the normal relations or conditions as nearly as practicable. In many cases the laceration of the tissues has not been so great as the stretching of the posterior wall and the formation of the condition known as a rectocele which results from a diastasis, or separation of the levator ani muscles. This has been mentioned as more likely to occur in incomplete lacerations. The lesion leaves nothing to combat and overcome the resistance of the sphincter ani muscle, and, as a consequence, the projection of the posterior vaginal wall—the rectocele—becomes more and more marked.

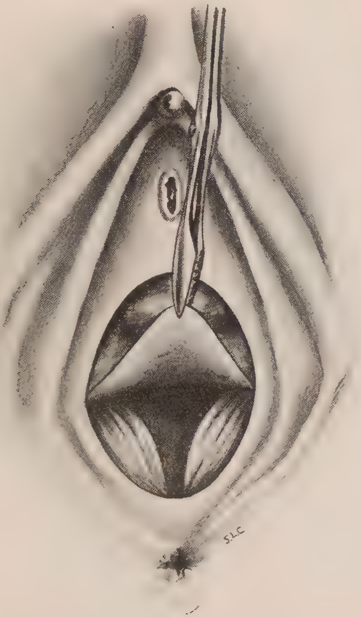


FIG. 259.—Raising Flap for Perineal Operation, Exposing Diastosis of the Levator Ani Muscle.

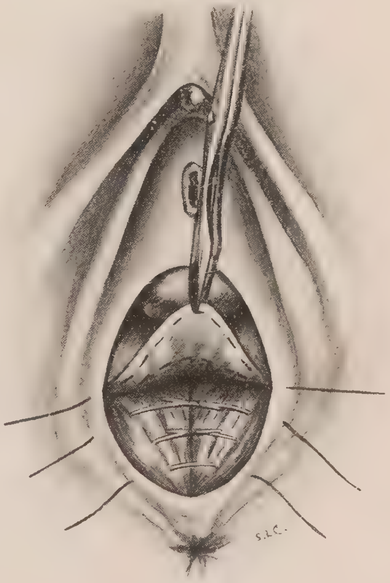


FIG. 260.—The Flap Raised, Exposing the Levator Ani Muscles and the Sutures Inserted to Draw in the Muscles.

The operative procedure to be effective must so reinforce the pelvic structures as to restrain this disposition of the posterior wall to eversion.

The operative procedures devised for the restoration of the pelvic floor may be divided into three classes: 1, denudation; 2, flap-splitting; and 3, muscular reconstruction.

Only the desire to render this subject prominent justifies the last designation, for the operation can be made to supplement either of the other two and in my practice is used in a modification of the second almost entirely.

Recognizing the importance of the levator ani muscles in the support of the outlet of the abdomen, it had been my custom for several years to utilize them by modifying the Emmet operation (to be described later). By carrying the dissection through the fascia on either side of the vagina, exposing the edges of these muscles, and raising them by the introduction of sutures, they were crowded in front of the intestine. In 1895, in marked cases of rectocele I removed a triangular section of the posterior vaginal wall, starting at the point of the beginning of the rupture on either side with its apex at the summit of the rectocele. Buried catgut sutures were passed so as to pick up the levator ani on each side and crowd them forward in the median line, after which the mucous and skin edges were united by a continuous catgut suture. In 1906, I began to expose the muscles by dissecting up a flap similar to the method recently advocated by Barrett, and the union of the levator ani muscles beneath it. The operation is done as follows: The patient lies on her back with the legs held in marked flexion by leg holders. The vulva is held open by an assistant, while I pick up the mucosa in the median line with tissue

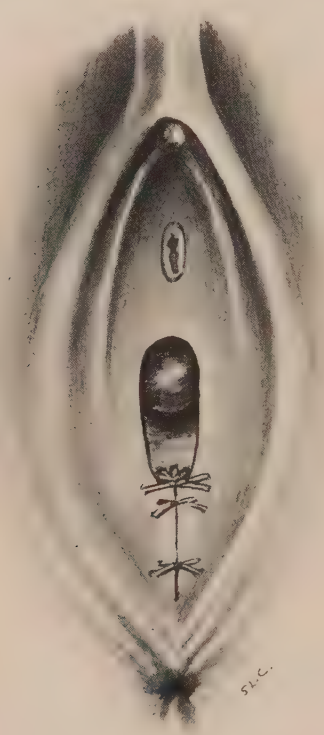


FIG. 261.—The Operation Completed.

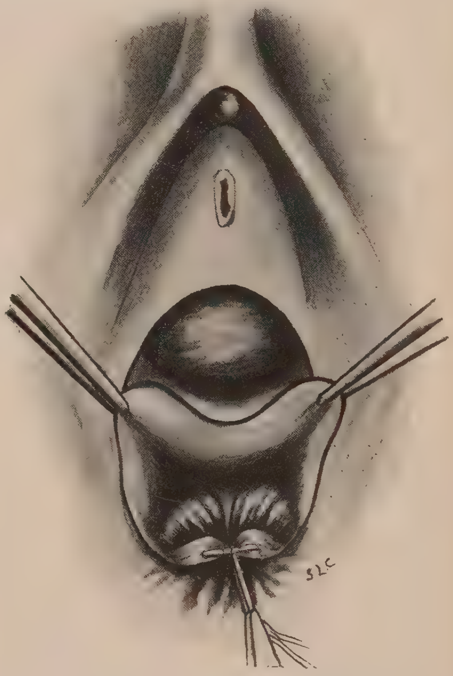


FIG 262.—Dissection for Complete Laceration of the Pelvic Floor; Ends of the Sphincter Ani United; Suture Inserted to Bring Forward Levator Ani Muscles.

forceps, and cut through it with scissors in the lower margin of the vagina. This incision is carried laterally on either side to the border of the remains of the carunculæ myrtiformes. Then, after loosening cicatricial bands posteriorly, the flap thus formed is separated by blunt dissection until the summit of the rectocele has been reached (Fig. 259). About the middle of this exposure a needle armed with a chromic catgut suture is passed deeply into the structure of the left levator ani, thence picks up the summit of the under surface of the flap, and out through the right levator. This suture drawn taut permits the muscles to be picked up below and above by sutures. The upper suture picks up the center of the flap. Traction on the flap is discontinued and the sutures are tied and cut close. (Fig. 260.) A suture now passed through the left angle of the dissection follows around the margin of the flap and is brought out at the right angle. This suture tied forms the posterior margin of the new vulva, while the remaining raw surface is closed by two or three interrupted sutures. (Fig. 261.)

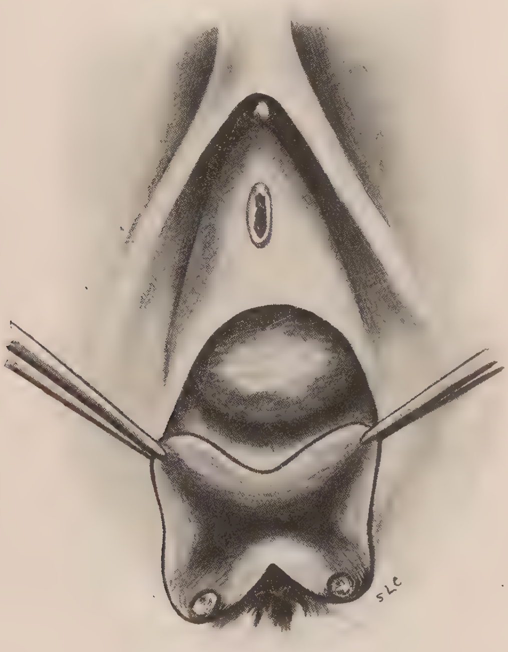


Fig. 263.—Dissection for the Restoration of a Complete Laceration of the Fourth Degree.

This, with a slight modification, serves well for complete laceration of the perineum of the first degree. The rectovaginal septum is split along or a little above its margin; the flap is carried forward as in the last procedure, and slightly backward to expose the ends of the torn sphincter muscle. These exposed ends are sutured with two or three catgut sutures, insuring their accurate apposition, when the levator ani muscles are united as in the preceding operation. (Fig. 262.)

Where the tear extends up the rectovaginal septum, its margins should be split and rectal and vaginal flaps formed, after which the margins are sutured from the vagina side, making sure that the ends of the sphincter are secured. This line of sutures is covered by another row which brings forward the levatores, and finally the surface mucosa and skin can be united with either continuous or interrupted sutures. (Fig. 263.) These operative procedures have the following advantages:

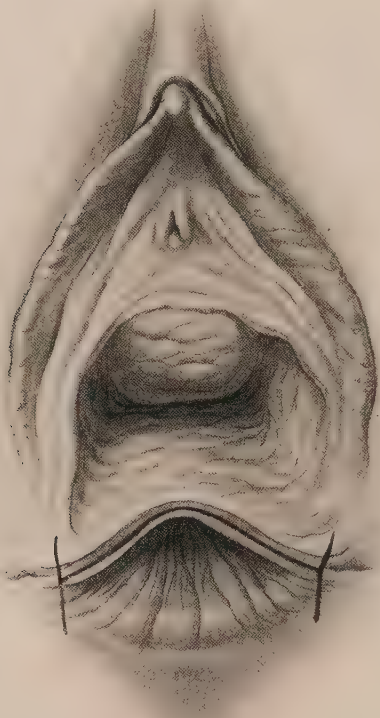


FIG. 264.—Outline for Simpson's Operation.

1. They preserve the tissue without loss.
2. They insure the reinforcement of the pelvic floor by crowding inward the levator ani muscles, thus affording the greatest assurance against the reproduction of the vaginal hernia.
3. The procedure is a simple one and requires the minimum of time for its performance.

These operations are the evolution of principles so ably inculcated by

Marcy, Simpson, and Tait, and adapted by Noble, Reed, Barrett, and others.

The earliest flap operation on the perineum was that of Alexander Simpson. It was projected for the restoration of complete laceration. The flaps were outlined by splitting the rectovaginal septum and forming the anterior and posterior segments by incisions on either side at the junction of the skin and mucosa. The anterior flaps were united to form the posterior vaginal wall and the posterior, the anterior rectal. (Figs. 264 and 265.)

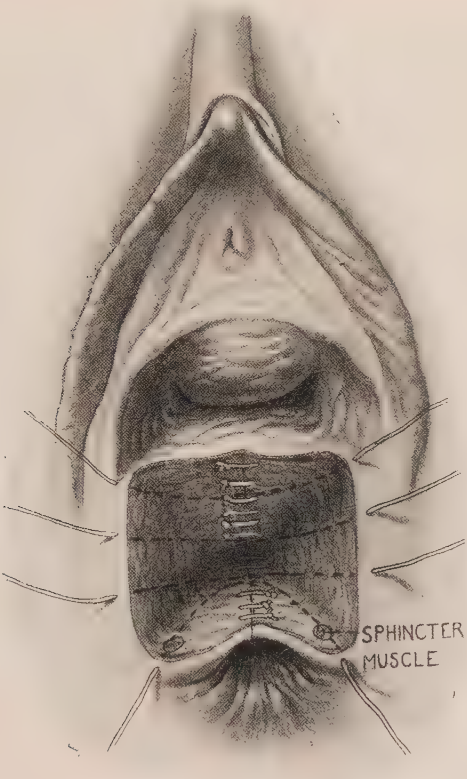


FIG. 265.—Sutures Introduced in Simpson's Operation.

The intervening raw surface is united with sutures to form the new perineum.

The most representative operation of the flap procedures is that devised by Tait, differing somewhat in the incomplete and complete lacerations.

In incomplete tears the rectum is tamponed with a sponge or with cotton or iodoform gauze covered with vaselin and furnished with a thread. While an assistant separates the vulva, two fingers are passed into the rectum, rendering the posterior wall tense. To form the flap, Tait uses pointed angular scissors. The point of one blade is inserted in the median line at the mucocutaneous junction, and the rectovaginal septum is split to the depth of two centimeters, first to the left and then to the right, and is carried forward upon each side to the point at which he wishes the posterior commissure to be. (Figs. 266, 267, and 268.) This forms a semicircle following the mucocutaneous junction. The flap is drawn up by tenacula and further separated to the required depth. On the borders the incision is carried deeply into the cellular tissue of the perineum and labium majus. Bleeding is controlled by forceps, and later by the pressure of the sutures. The sutures are passed with the fingers in the rectum as a guide. They pass transversely across the wound, the skin not being included. Four sutures are generally sufficient. The sutures are secured after the wound has been washed with sublimate solution (1:1000) and the tampon has been removed.

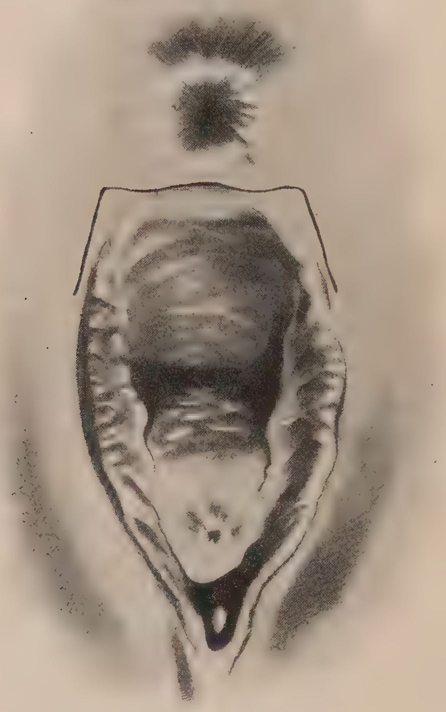


FIG. 266.—Incision for Tait's Operation for Incomplete Laceration.

Sänger closes the skin edges with superficial sutures.

In *complete laceration* the rectovaginal septum is split, forming a rectal and a vaginal flap, depending in extent upon the depth of the tear. Sänger advises that it be made with the bistoury. These flaps are loosened at either extremity by prolonging the incision upward just within the labia, and downward alongside the anus, thus forming a letter **H**, the transverse bar of which is formed by the split in the septum, and is at the lower part of the letter. These flaps, when separated, form a quadrilateral. Great care must be exercised in the introduction of the first suture, which must include the ends of the sphincter ani.

Ristine of Knoxville, Tenn., in complete perineal operations outlines in the vagina the tissue which he considers as necessary to be denuded for the proper restoration of the pelvic floor and dissects this down as a flap which he utilizes after the closure of the wound in the protection of the newly united wound from infection by the contents of the rectum. The dissection exposes the divided ends of the sphincter muscle which are united with silkworm gut sutures. (Fig. 269 and Fig. 270.) After joining its edges with sutures, the flap is brought over the line of union to protect it from fecal infection. This flap can be clipped off at a later date after it has served its purpose, but it usually shrinks and gives no inconvenience. Noble, of Atlanta, accomplished the same purpose by loosening and drawing down the anterior wall of the rectum as a flap. Other operations in which flaps were formed and utilized were those of

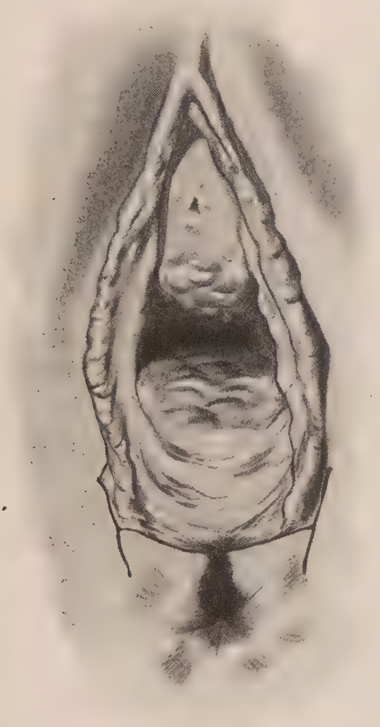


FIG. 267.—Line of Incision for Tait's Operation for Complete Laceration.

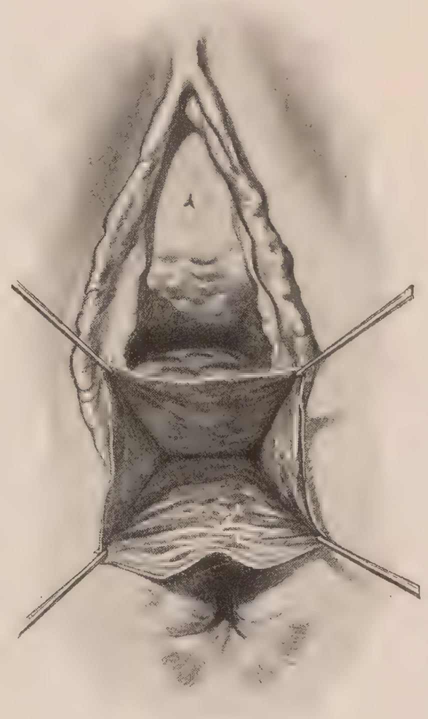


FIG. 268.—Appearance of Surface after Formation of Flaps.

Bischoff and Andrews. (Fig. 271, Bischoff's operation. Andrew's, Fig. 272.) Andrews retracted the flap behind the cervix.

Fritsch's operation follows the principle of the Tait operation in the formation of flaps. He separates the vagina from the rectum and adds a lateral incision for the sphincter when its ends are retracted. The ends of the sphincter are held in place by a provisional suture which ensures the restoration of the normal shape of the orifice and permits the accomplishment of the reunion. The rectum is restored by the Lauenstein suture of catgut. The same suture is employed to close the vagina while the perineum is closed by superposed planes, or continuous catgut sutures in terraces can be used. (Fig. 275 and Fig. 276.)

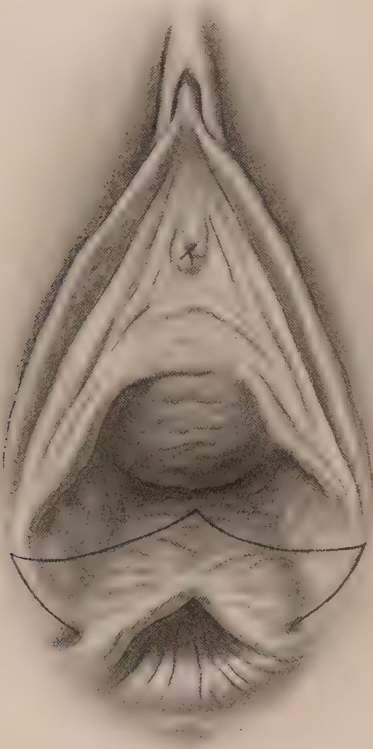


Fig. 269.—Outline of Flap to be Turned Down to Form Raw Surface for Union. Flap thus Formed to Protect from Fecal Infection. (*Ristine.*)

An operation devised by Alexander Duke may be classed with the flap operations. It is performed by passing the left index finger nearly its entire length, into the rectum; while, with a doubled-edge bistoury held in the right, the septum is penetrated a distance of six centimeters. (Fig. 277, 278, and 279.)

As the lateral ends of the incision are pressed toward each other a lozenge-shaped opening appears. The sutures are introduced with a strong, sickle-shaped needle with eye in point, and silver wire is preferred for the suture. The needle is introduced just beyond the end of the incision, and guided by the finger into the rectum, is made to encircle the incision, to be brought out beyond its opposite end. Drawing up this suture will give an idea of the number of additional sutures required. The sutures secured, the distance between the anus and the posterior commissure is considerably increased, with the formation of a thick perineal body.

The denudation of the torn vaginal outlet was the first method devised for the restoration of the perineum which was then regarded as an exceedingly important structure. In the performance of the operation, as the cicatrization produced contraction, it is necessary to extend the denudation of the vagina beyond the scar tissue. The extent and character of the denudation necessarily depends on whether the laceration is complete or incomplete. Incomplete laceration (Fig. 255) may be repaired by a simple denudation of the torn surfaces. (Fig. 280.)

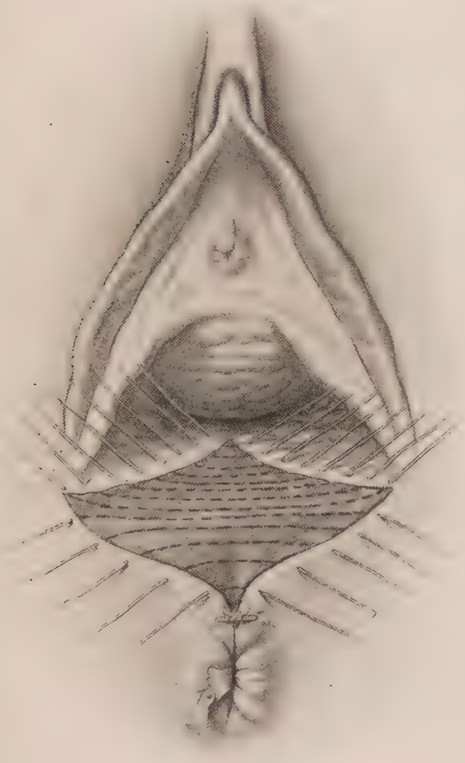


FIG. 270.—Flap Turned Down. Sphincter Closed and Sutures Introduced. (*Ristine.*)

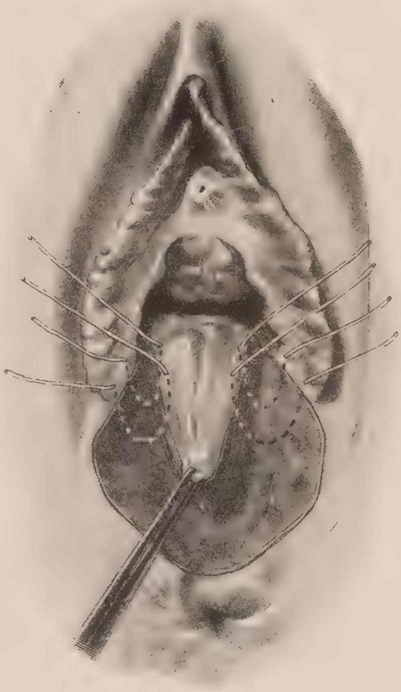


FIG. 271.—Bischoff's Operation.

The line of denudation extends posteriorly from the junction of the mucous membrane and skin at the top of the old posterior commissure across in front of the anus to a corresponding point upon the opposite side, while an angle extends up the vagina above the tear. The completed denudation presents a resemblance to the body and wings of the butterfly, and is designated the Simon-Hegar denudation. (Fig. 280.)

The sutures are introduced about three millimeters from the margin of the wound, buried beneath the denuded surface, and brought out at a corresponding point upon the opposite surface. First the sutures in the vaginal angle are secured, and then the perineal. (Fig. 281.) The sutures when tied produce less discomfort than if secured by compressing perforated shot upon their ends. The quill or bar suture was formerly much favored. It consisted of a quill placed in the loop of a double suture upon one side, the ends being tied over a second quill upon the opposite side; or the ends of a suture were passed through openings in a bar and secured by compressed shot. The two quills or bars served for all the sutures, while the skin edges were united by superficial sutures. The suture caused so much pain that it scarcely ever is used now.

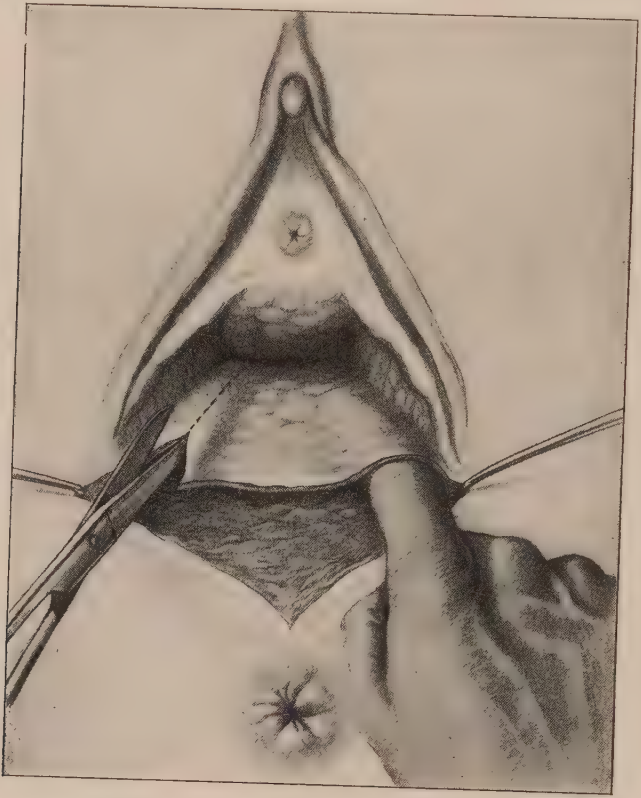


FIG. 272.—Splitting Vaginal Wall Preparatory to Suture. (*Andrews.*)

A slight exaggeration of the denudation just described can be applied to the restoration of a complete laceration. The sutures must then be vaginal, rectal, and perineal. The latter are introduced after the former are placed. The rectal sutures of catgut are brought out into that canal. Care must be exercised in the introduction of the first perineal suture that it shall bring the ends of the sphincter ani in apposition accurately.

Garrigues modified the Hegar operation by the following procedure (Fig. 282): According to the extent of the laceration and relaxation of the vagina and perineum the vagina is seized with a double tenaculum at a point in the median line more or less removed from the cervix. A point upon each labium majus is secured at such a distance from the clitoris as to permit of coition. The parts are rendered tense, the points are connected by an incision, and the intervening triangular surface is denuded. This denudation is carried downward to the margin of the skin and mucous membrane. With the vulva separated the denudation presents a triangular surface.

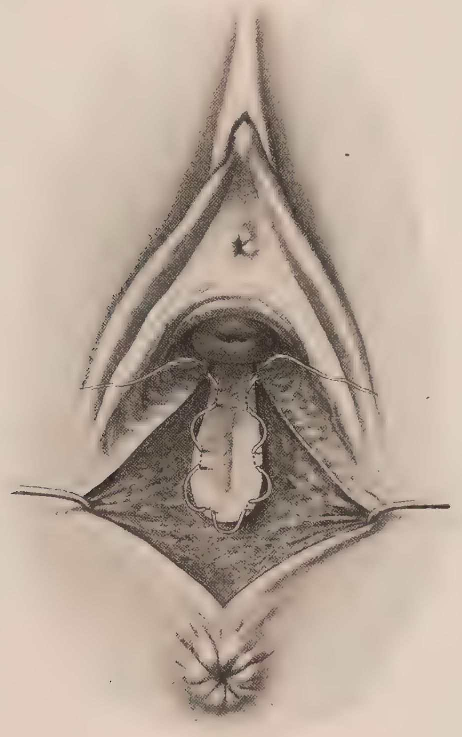


FIG. 273.—Introduction of Suture in Retracted Flap. (*Andrews.*)

The denudation is most rapidly accomplished by introducing one blade of curved scissors beneath the membrane at the point determined upon in the one labium and carrying it around the vaginal outlet to a similar position opposite. The central part of this incision is picked up with forceps, cicatricial bands are cut, and the finger pushed beneath this flap to the desired height. The tissues are pushed off laterally, and the triangular section is removed. This has the advantage of being more than a denudation. It is a resection, and, therefore, permits the more accurate union of fascia and muscular structure.

The sutures are introduced from above downward, about six millimeters apart, deep and superficial alternating, the latter passing only through the edges of the mucous membrane. The four upper sutures are transverse; the remainder dip downward at the central portion, and, when tied, lift up the relaxed wall. The sutures are thus introduced and tied one after another until the remaining denuded surface forms an ellipse, the upper and lower borders of which are of equal length. (Fig. 283.) Then a silkworm gut suture (10) one centimeter above the posterior commissure is carried deeply beneath the wound two-thirds the width of the denudation, and emerges at a similar point upon the opposite side. A second suture (11) is inserted midway between this

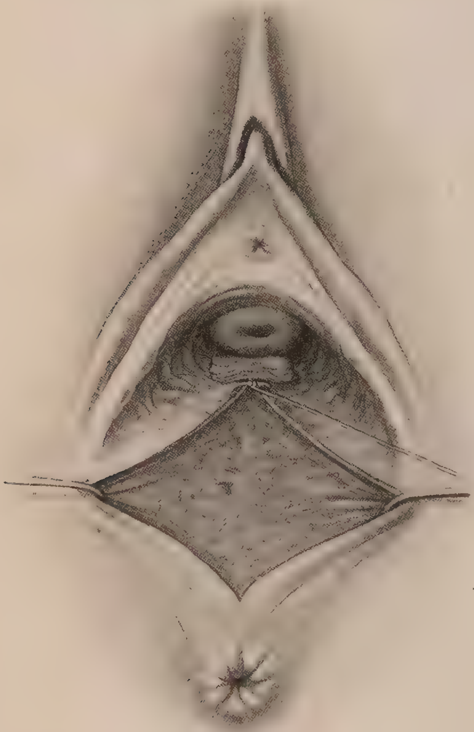


FIG. 274.—Suture Tied; the Remaining Surface to be Closed by Transverse Sutures. (*Andrews*.)

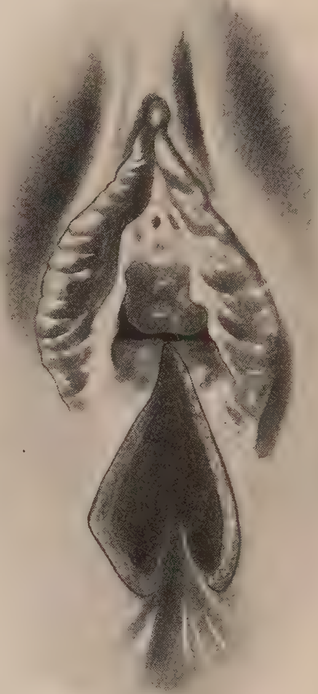


FIG. 275.—Denudation for Fritsch's Operation.

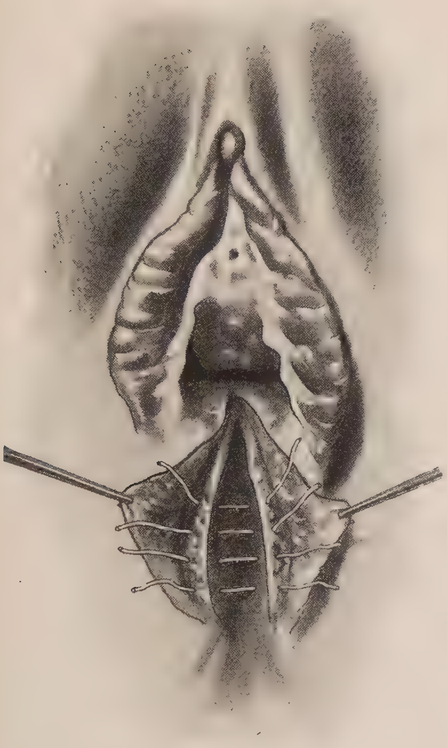


FIG. 276.—Catgut Sutures for Union of The Rectal Wall.

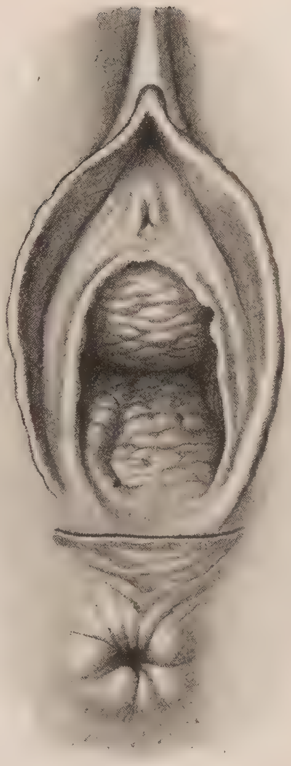


FIG. 277.—Incision for Duke's Operation.

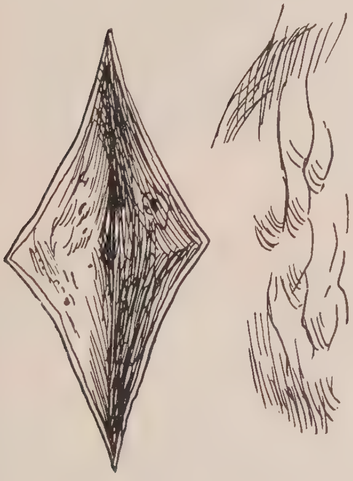


FIG. 278.—Incision Separated in Vertica Direction.

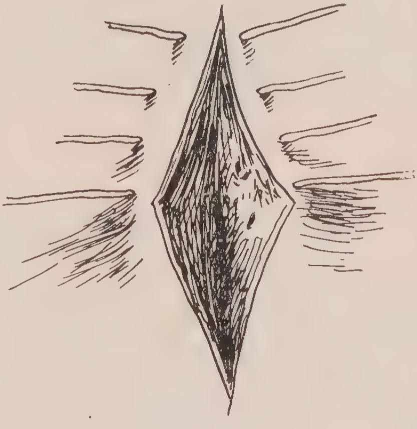


FIG. 279.—Incision United by Transverse Sutures.

suture and the outer margin; passing beneath the denuded surface it emerges upon the vagina to the left of the median line, is reintroduced, and comes out equally distant from the first suture upon the right side. The last suture, introduced near the extremity of the denuded surface, appears in the vagina midway between the second suture and the external denuded angle, reënters upon the opposite side, and emerges upon the right labium. These three sutures are all introduced and the surface is irrigated, then they are secured. (Fig. 284.)

The employment of the continuous chromic catgut suture would seem more satisfactory. It can be so introduced as to lift up the pelvic floor, and include the edges of the levator ani muscle and the overlying fascia. If the floor is much relaxed, the muscle and fascia can be sutured separately and the mucous surfaces be closed over it with a continuous suture. This method greatly expedites the operation and has the advantage that it leaves no sutures (Fig. 291) to be removed.

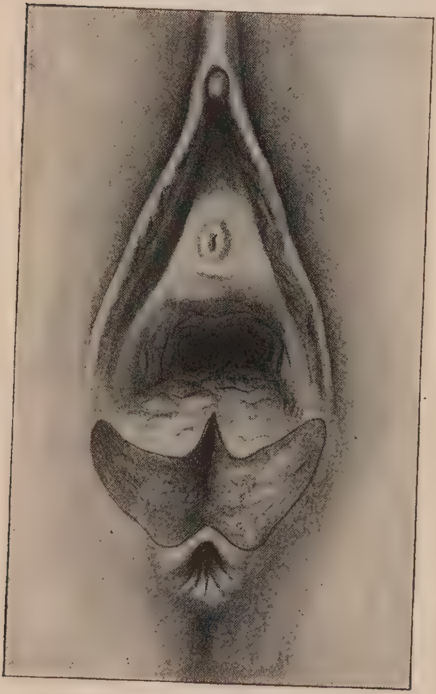


Fig. 280.—Simon-Hegar Method of Denudation.

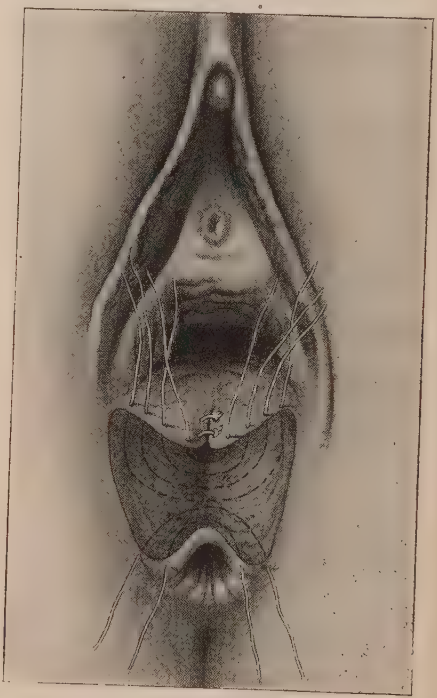


Fig. 281.—Sutures Introduced to Close the Wound.

Lauenstein's method of introducing the sutures was devised to prevent their infection by rectal and vaginal discharges. The sutures, of catgut or fine silk, are introduced in the denuded surfaces, including about five millimeters of the tissue intervening between the borders of the rectal and vaginal mucous membranes respectively. (Fig. 285.) These are necessarily buried sutures. The remaining portion of the denuded surface is closed by silver wire from the perineum. (Fig. 286.)

Hildebrandt makes the denudation trefoil in shape. (Fig. 287.) The sutures are, for the most part, cutaneous. The vaginal sutures are first introduced; next the rectal, and, finally, the perineal. (Fig. 288.) This method of suturing obliterates dead space and decreases the danger of abscess.

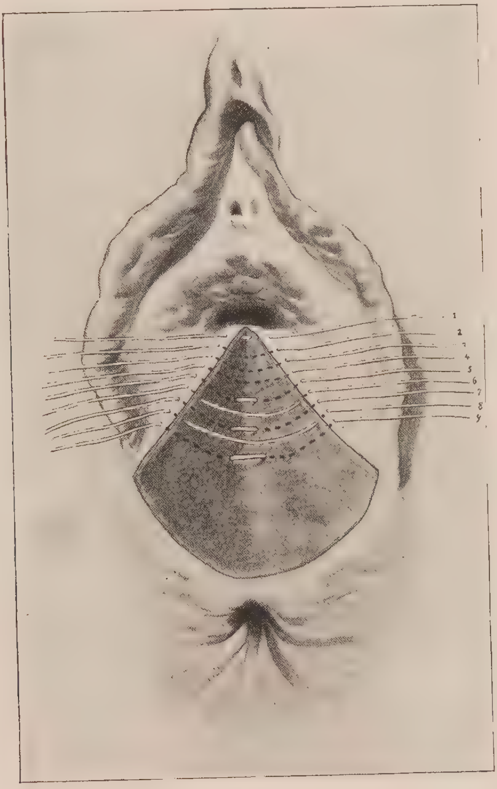


Fig. 282.—Garrigues' Modification of the Hegar Operation.

Heppner accomplishes the same object with a figure-of-8 suture, which closes both vaginal and perineal surfaces. (Fig. 289.)

Martin more rapidly, and with a less complicated procedure, meets the difficulty. (Fig. 290.) With a continuous catgut suture, he unites the intestinal wound from the rectal surface; when he reaches the anus, with the same suture in a contrary direction he superimposes a layer up to the superior angle of the vagina, and, if the denudation is deep, a third layer before the vaginal and perineal surfaces are united. (Fig. 291.)

Freund has emphasized the necessity of securing such a denudation as would reproduce the original appearance of the tear. This, if there is a cicatrix, which presents the appearance of ∞, the laceration from which it has contracted may be represented by figure 292. He incises the posterior column of the vagina at a certain distance from the scar and carries the bistoury backward along the sides of this column, circumscribing the cicatrix in the vagina and upon the labia majora (Figs. 293, 294, and 295), and completes the denudation as in an ordinary operation. The line which corresponds to the rectum is sutured, then each edge of the posterior vaginal column is united to the external margin of the denuded surface. The union of the lines forms the vulvar and perineal surfaces.

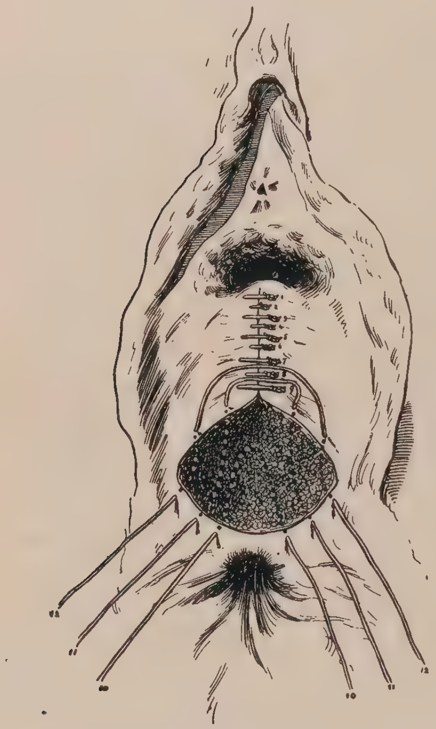


FIG. 283.—Upper Part of Wound Closed; Last Sutures Introduced.

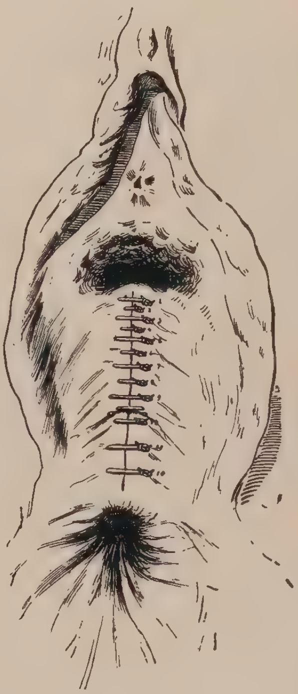


FIG. 284.—Wound Completely Closed.

Of the denudation operations, that of Emmet without question takes the first place. Its purpose is to expose the fascia and so introduce the sutures as to fold in the slack and lift up the perineum and bring it more under the control of the levator ani muscles.

More fully than any preceding measure, the operation devised by Emmet supplied the support required for the tendency to prolapse of the posterior vaginal wall, in the incomplete lacerations of the pelvic floor. He constructed a quadrilateral denudation upon the posterior aspect of the vulva and vagina by fixing with tenacula the remnants of the hymen, the caruncula on each side of the vagina, the margin of the cicatricial tissue posterior, and the summit of the rectocele above. With these points separated, the intervening mucosa was removed. The sutures introduced from the vaginal surface formed a double triangle (Fig. 296) and when tied lifted the levator ani and its fascia. The next suture unites the labia with the point of the denudation in the vagina. It is known as the crown stitch and forms the subsequent posterior commissure of the vagina. The raw surface beneath it is united with sutures. (Fig. 297.) (Emmet's operation. Lateral angles closed and crown stitch introduced.) (Fig. 298.) The majority of the sutures is in the vagina and the posterior segment of the pelvic floor is brought more closely in contact with the anterior.

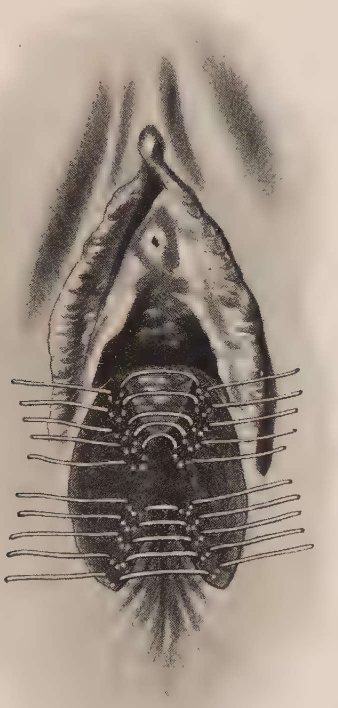


FIG. 285.—Lauenstein Suture.

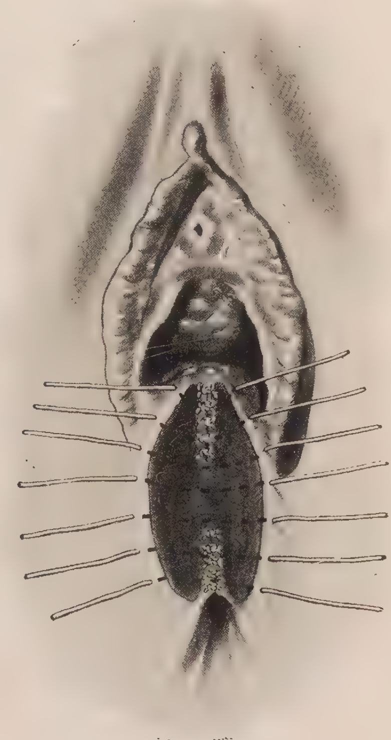


FIG. 286.—Rectum and Vagina Closed with Lauenstein Suture.

Noble modifies this operation by carrying his denudation higher upon the posterior column, splitting the fascia, and exposing the levator ani muscles. In suturing, he pulls out the muscle and secures it with not

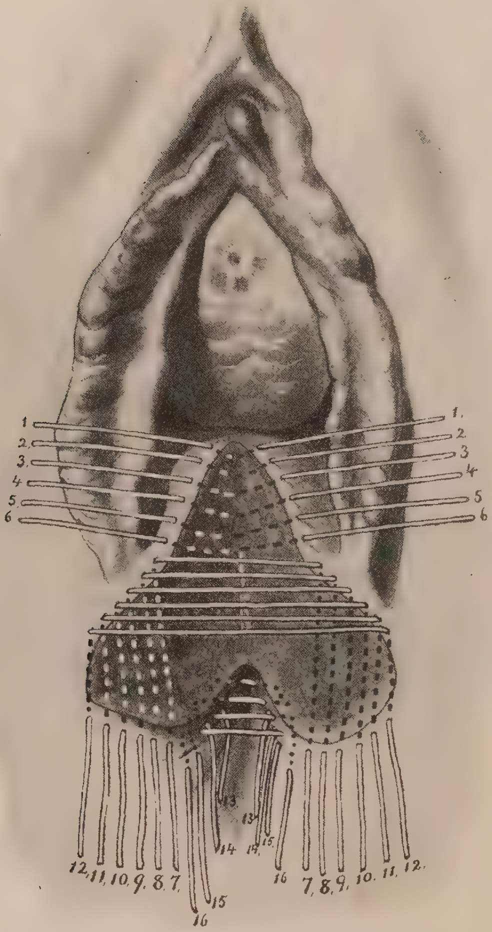


FIG. 287.—Hildebrandt's Method of Suturing.

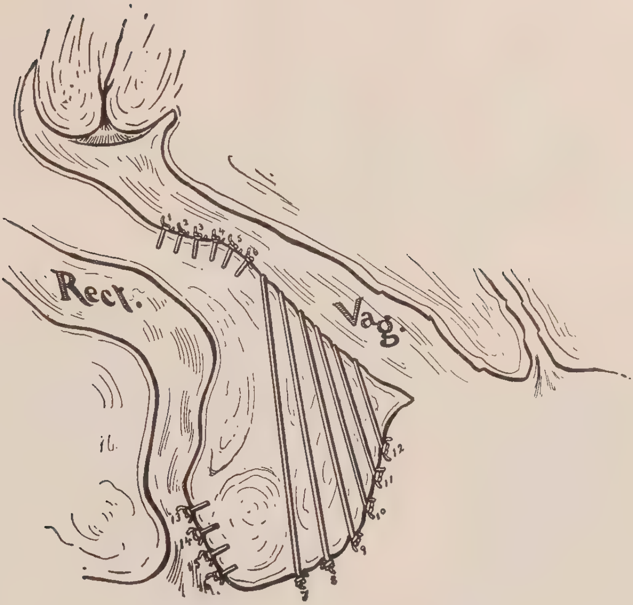


FIG. 288.—Hildebrandt Suture Closed.

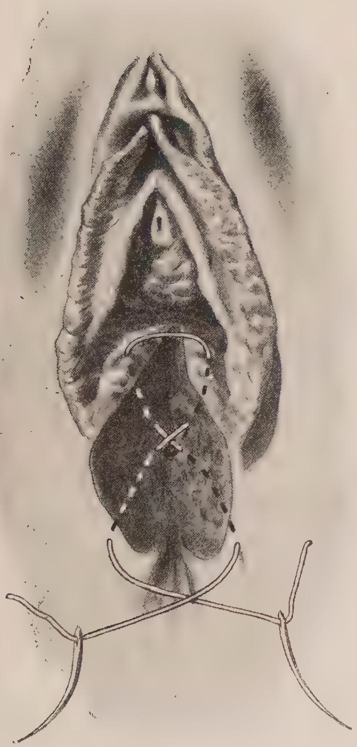


FIG. 289.—Heppner's Figure-of-8 Suture.

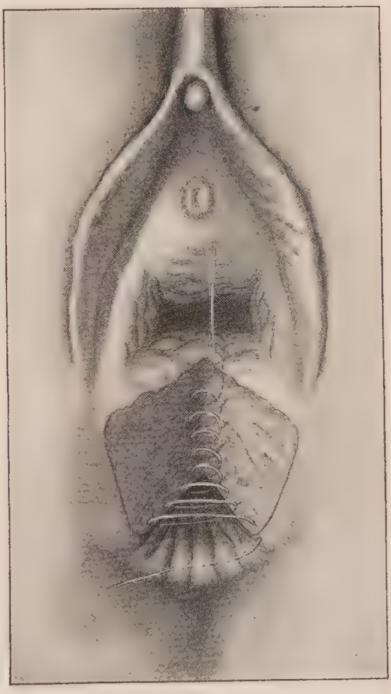


FIG. 290.—Martin Suture to Close the Rectal Opening.

only the lateral, but also the central, sutures, or those below the crown suture. This brings the muscles in contact in front of the rectum and insures a strong support to the pelvic floor.

Emmet's operation for complete laceration has for its first and principal aim the restoration of the sphincter ani. The first suture is introduced and brought behind the ends of the torn sphincter, which have been carefully exposed in the denudation. (Figs. 299 and 300.) As the suture is drawn up and secured the precaution is taken to draw up and place in position the ends of the sphincter, so that they may be secured firmly. The remaining sutures appose the denuded surface of the perineum.

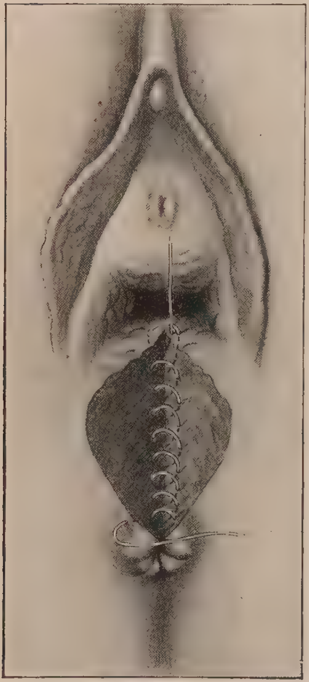


FIG. 291.—Martin Suture Continued.

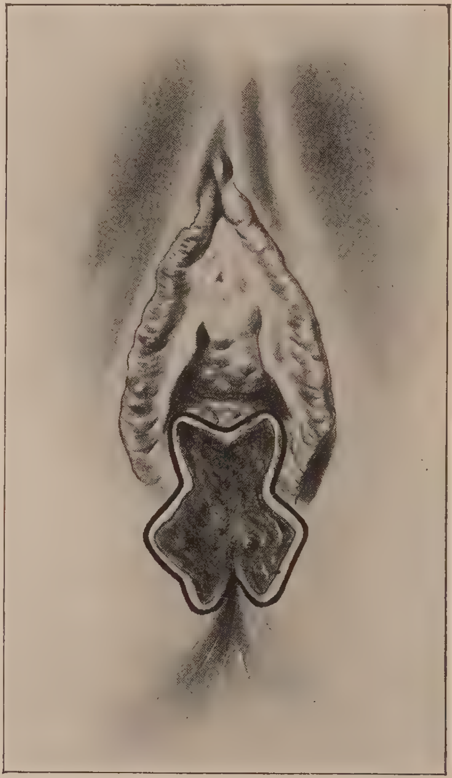


FIG. 292.—Denudation for Freund's Operation.

Outerbridge modifies Emmet's operation in that he uses but three sutures. The first, of medium-sized catgut, by means of a needle threaded with a carrier loop, is passed from the end of the central undenuded portion to the summit of the lateral denudation upon either side. It is thrown over the pubes and a silver-wire suture is passed from the highest point of the denudation upon one labium majus beneath the whole wound across to the corresponding point upon the opposite side. (Fig.

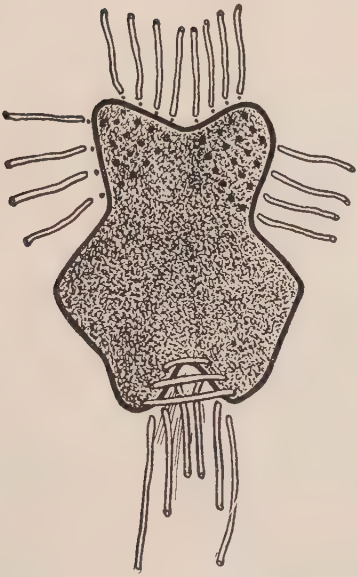


FIG. 293.—Sutures Inserted in Rectal Wall and Lateral Vaginal Angles.

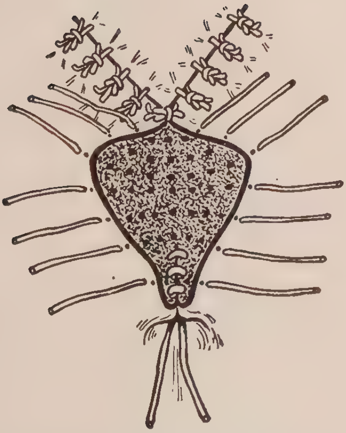


FIG. 294.—Vaginal Angles and Rectal Wall Closed. Suture in Place for Perineum.

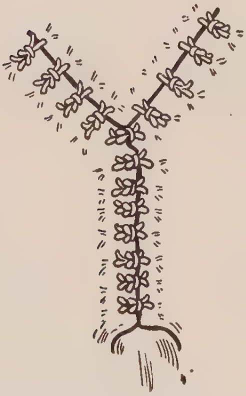


FIG. 295.—Denudation Completely Closed.

301.) The catgut suture is now tied and its ends are passed downward to penetrate the skin upon each side one centimeter from the lowest point of the denudation. This suture tied, the silver wire is secured. The latter suture is removed upon the eighth day.

Cleveland uses a figure-of-8 suture of catgut. (Fig. 302.) The first suture enters the skin six millimeters from the wound margin and midway between the posterior commissure and the summit of the denudation in the left labium, passes deeply across between the denuded surfaces and rectum, embracing the muscles, and emerges upon the right labium six millimeters from the wound margin. Midway between the posterior commissure and the point corresponding to its entrance, the suture is reintroduced at a similar point upon the left labium, and emerges upon the right, directly opposite its original entrance.

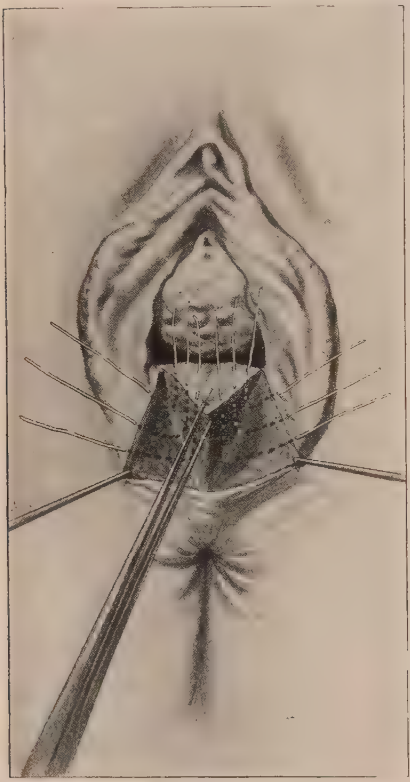


Fig. 296.—Emmet's Operation. Surface Denuded and Lateral Sutures in Place.

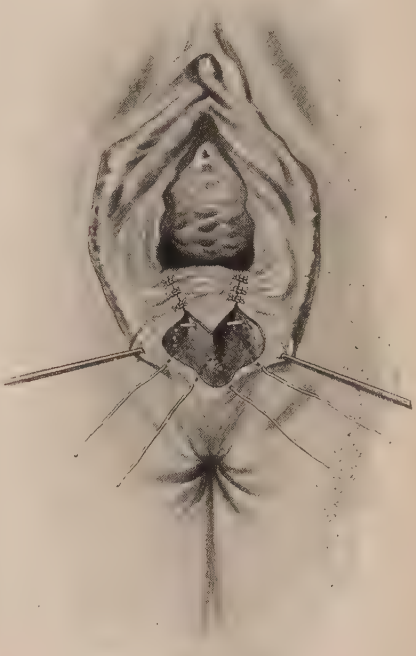


Fig. 297.—Emmet's Operation. Lateral Angles Closed and Perineal Suture Introduced.

The second suture follows a similar course. It enters the left labium near the summit of denudation, is buried beneath the edge of the denudation to the center of the vaginal column, then passes downward, and

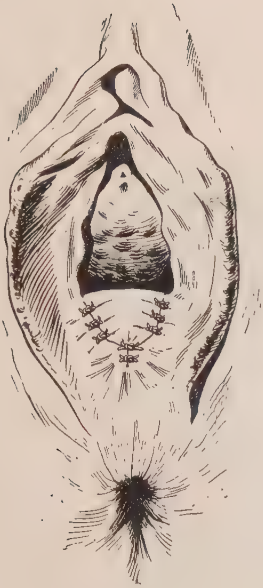


FIG. 298.—Emmet's Operation Completed.

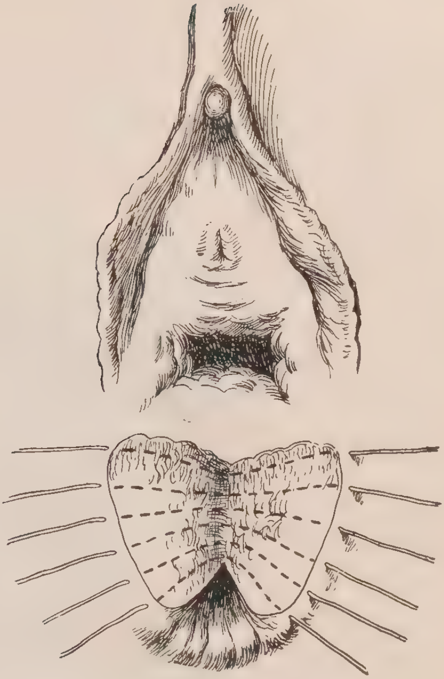


FIG. 299.—Emmet's Operation for Complete Laceration.

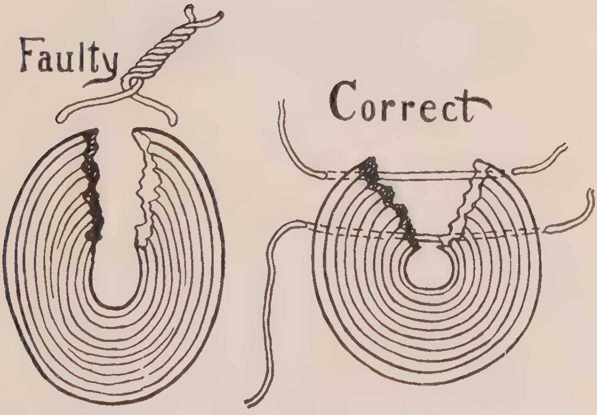


FIG. 300.—Suture to Unite the Ends of the Sphincter.

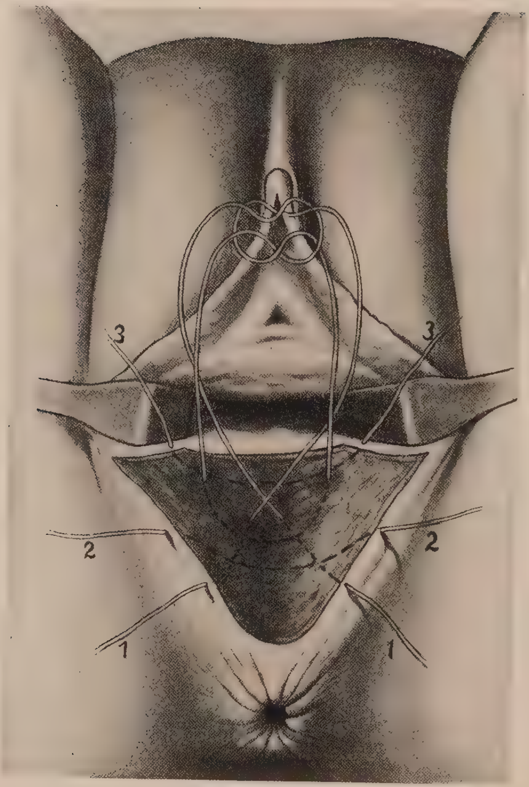


FIG. 301.—Outerbridge's Suture.

emerges upon the right labium midway between the summit of denudation and the exit of the first suture. It is introduced upon the left labium at a corresponding point, passes across its former course, follows the border of the right sulcus, and emerges beneath the right summit.

A suture of wire or silkworm gut, for support, is passed through the left labium, about eight millimeters above the denudation, and about the same in the anterior vagina and the right labium.

A. P. Dudley made a quadrilateral denundation with angles at the summit of the rectocele, laterally at the caruncula, and at the posterior commissure. The denudation removes only the mucous layer, preserving the submucous. (Figs. 303 and 304.) The finger is introduced into the anus and the first suture is passed downward and forward to the median line, where it is brought out, reintroduced three millimeters from its exit, and carried upward and backward to emerge upon the other side of the vagina. This suture is tied, and acts as a fixed point from which to work. The remaining sutures, of juniper catgut, are made over and over and are introduced in a direction similar to the first, taking care to push up the rectocele with a director as each stitch is tightened. As the outlet is approached the angle of the sutures is decreased, until, when abreast of the hymen, they are passed transversely. At this point the inside work is finished and the suture is made fast. A number of buried sutures are passed through the fibers of the separated central

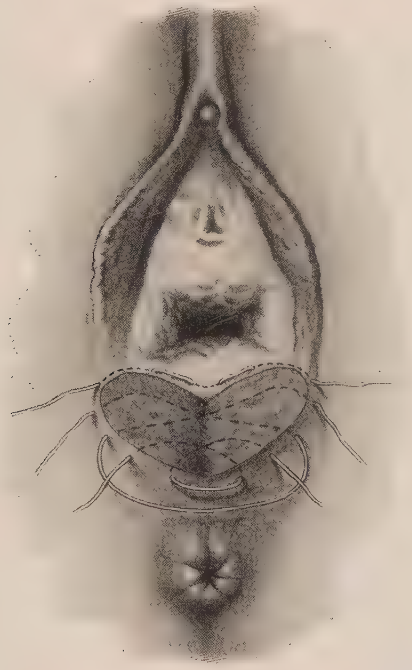


FIG. 302.—Cleveland's Suture.

tendon. These extend to the extremity of the rent, when, with a continuous suture, they return to the point where the deep sutures began. After examination of the wound for bleeding points or gaping of the surfaces the wound is dusted with iodoform, and is not disturbed for four days.

Martin, in extensive relaxation of the pelvic floor, supplements the operation upon the vulvar outlet by a denudation of the lateral columns of the vagina, leaving a tongue-shaped, undenuded strip in the median line of the vagina. (Figs. 305 and 306.) Each lateral denudation is obliterated by continuous suture, after which the outlet is closed with transverse sutures. (Fig. 306.)

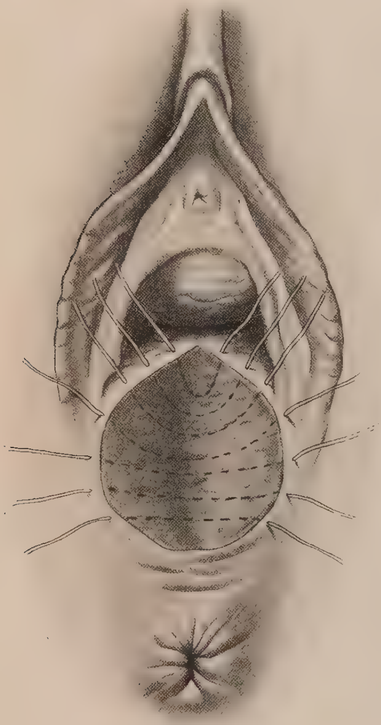


FIG. 303.—Dudley's Operation with Interrupted Sutures.

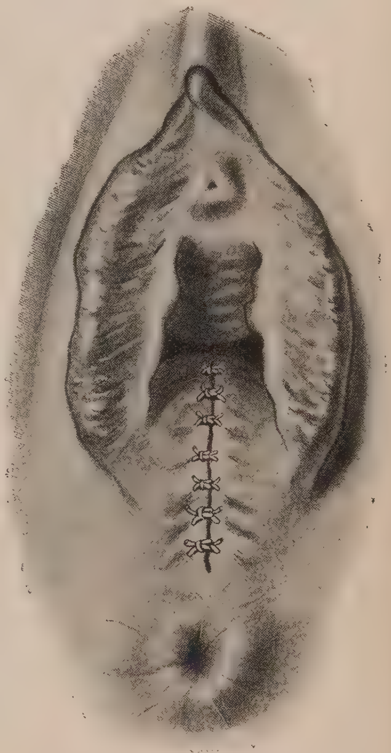


FIG. 304.—Dudley's Operation Completed.

Choice of Operation. It should be understood that no operation is applicable to every patient. The operation should be adapted to the special condition. The flap-raising procedure with union of the muscles by buried catgut sutures comes nearer to being applicable to all conditions than any other. For complete laceration the first consideration must be the restoration of the sphincter, and this is most effectively accomplished by union of the divided ends by buried catgut sutures after which the levator ani muscles are united over the sphincter. The vaginal walls are unlikely to be prolapsed in complete lacerations.

After-treatment. Immediately after operation cleanse the vulva with alcohol and water, equal parts, dry and apply a sterile gauze pad which should be retained by a **T**-bandage. The nurse should be directed to sponge the parts with the same solution, whenever soiled The patient is unlikely to suffer pain, unless the laceration has been complete, when a suppository of opium extract, gr. j, and hyoscyamus extract gr. ss, can be administered. The urine should be evacuated spontaneously and the parts subsequently sponged. The position of the patient may be changed, but she should be discouraged from making severe efforts. In *incomplete* lacerations the diet will not require careful scrutiny, but in the *complete* it should be limited during the first week to animal broths, and for another week to articles that are easily digested. Secure an evacuation of the bowels upon the third day, and at least each alternate day subsequently. Exercise care that excessive purgation does not occur. The sutures, if of silk or silkworm gut, can be removed in eight days to two weeks. Catgut sutures need not be disturbed. Observe care in the removal of the sutures; the patient is preferably placed upon her side before a good light, and an assistant, by gently separating the buttocks, exposes the ends of the sutures, and facilitates their with-

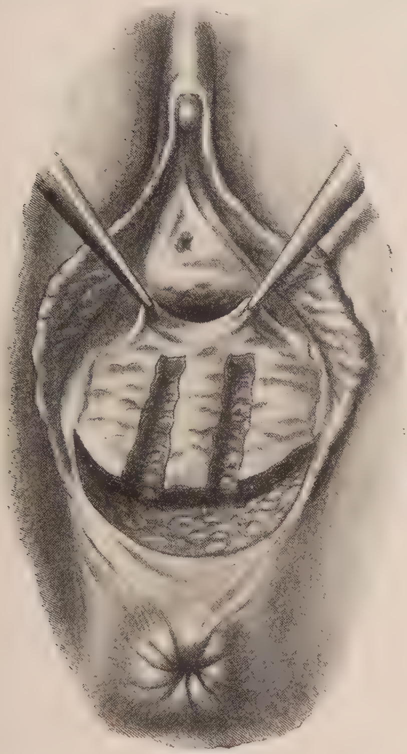


FIG. 305.—Denudation for Martin's Operation.

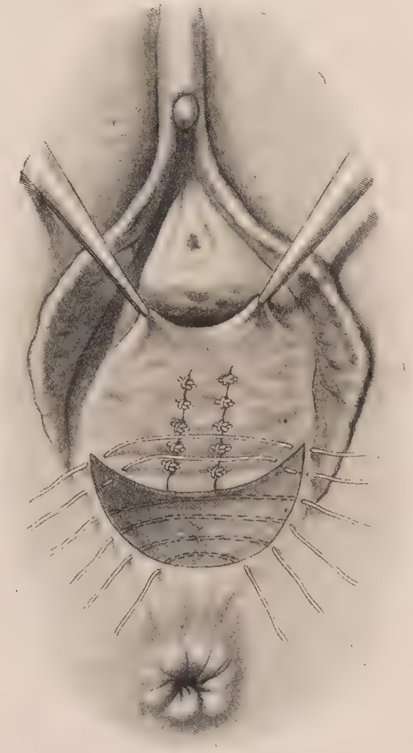


FIG. 306.—Vaginal Surfaces United; Perineal Sutures in Place.

drawal. Keep the patient in bed three full weeks. After the fourth day the vagina may be irrigated once or twice daily with a disinfectant solution—sublimate (1:2000) or formalin (1:1500). Advise her to do but little walking for a month, and interdict coition for two months.

INFLAMMATIONS.

227. **Recognition of the development of the genital tract** from the coalescence of the Müllerian ducts makes evident that it is a continuous canal which must be especially vulnerable to infection with its manifestation, inflammation.

Experience discloses that the alterations due to infection are rarely confined to a single portion of this tract, although the special structure of certain portions of the canal renders them more susceptible to the influence of micro-organisms. The cylindric epithelium of the cervical canal is more vulnerable to gonorrheal infection than the pavement epithelium lining the vagina. The recognition of the almost continuous uniformity with which the different parts of the canal become involved from the structure primarily infected, and the frequent difficulty in isolating the primary site have caused me to depart from the usual order in the consideration of this subject, and to discuss infection and the resulting inflammation as affecting the entire genito-urinary tract, and subsequently to consider the features of its local manifestations.

228. **Micro-organisms** are the most important exciting cause in the production of inflammation of the genito-urinary tract. Inoculation of a mucous surface with a micro-organism may result in an immediate inflammatory reaction, which may extend subsequently to the neighboring structures by one of three ways: the mucous membrane, the lymphatics, or the blood-vessels. The original site of inoculation may be the vulva, vagina, uterus, urethra, or the bladder surfaces, as these are more or less exposed to external contact. Even the entire tract may be involved.

The situation of the genital tract, the injuries to which it is exposed, and the opportunities for its infection by various germs render the comparatively infrequent occurrence of inflammatory attacks surprising. Immunity against infection is to some degree due to the difference in the character of the uterine and vaginal secretions. It will be remembered that the uterine secretion is alkaline, while that of the vagina is acid; consequently micro-organisms which would readily flourish in the one canal are unfitted for invasion of the other.

Any condition, then, which causes these secretions to be less antagonistic, or which leads the one to preponderate greatly, permits the activity of the germs and their products to become manifest. Lowered vitality, exposure to cold, menstruation, the increased flow incident to parturition or abortion, all render the secretion more alkaline and establish a more uniform soil for the development of micro-organisms. Apparently conditions which appear normal may be overcome at once when the tract has been inoculated with some virulent poison.

229. **Inflammation** has been defined as an expression of the effort

made by a given organism to rid itself of, or to render inert, noxious irritants arising from within or introduced from without. Inflammation may be acute or chronic, diffuse or circumscribed. It is *acute* when associated with pain, heat, burning, more or less swelling of the tissues, profuse discharge, and constitutional symptoms. It is *chronic* when the condition is somewhat protracted; the pain less severe or slight; the discharge less in amount and less irritating to the surrounding structure, and with slight constitutional reaction. *Diffuse inflammation* may involve the entire genital tract, as in streptococcic or gonococcic infection, either of which may extend the entire length of the genital canal, involving vulva, vagina, uterus, and tubes, and even the ovaries, peritoneum, and cellular tissue. The latter form of infection may invade the urinary tract simultaneously, but *circumscribed* or local irritation confined to a portion of the tract is much more common.

The causes of inflammation should be divided into predisposing and exciting. The *predisposing* causes are those which produce congestion and disturbance of the normal equilibrium of the tract and, consequently, promote a favorable condition for the inception of infection. Such are derangements of the internal secretions which either lessen the flow or render it excessive or irregular. They are caused by disturbances of menstruation, involution, or the occurrence of traumatism. The first includes the improper hygiene of menstruation, exposure to cold, fatigue, overexercise, and excessive sexual relation during the congestion immediately preceding or following menstruation, a cold bath taken to prevent menstruation, or neglect or imprudence following abortion, miscarriage, or parturition. The natural congestion following these periods is enhanced by exposure, permits infection by various micro-organisms, with the resultant interference of the normal physiologic results in inflammation, interference with the normal processes, and the subsequent development of inflammatory changes. Uncleanliness or want of care upon the part of physician or nurse in a manipulation during or following labor or an abortion, or in the use of the uterine or vaginal douche; upon the part of the patient in handling the parts with unclean hands; the act of masturbation; the employment of unclean instruments; the retention within the uterus or vagina of portions of placenta, decidua, or bloodclots following abortion or labor; the presence of foreign bodies, such as tampons, tents, stem pessaries, especially soft rubber pessaries, which are prone to become foul, can be properly considered as causes. Traumatisms, including lacerations of the perineum, vagina, and cervix, the unskilful management of abortion or parturition, rough or unskilful examination, careless use of the sound or intra-uterine manipulation without asepsis, and excessive or violent coition, are also contributing factors. Chemic and vegetable poisons, such as phosphorus and the essential oils, may cause acute metritis. A patient suffering with chronic inflammation may have acute attacks which are excited by overexertion, sexual excess, operations, or rough examinations. Inflammation may be promoted by the presence of uterine displacements, pelvic or uterine tumors, or profuse inflammatory exudates or morbid processes. The *exciting* causes are the pathogenic micro-organisms and their products. They are the gonococcus, the streptococcus pyogenes, the staphylococcus pyogenes aureus and albus, the bacillus coli communis, the bacillus tuberculosis, and the saprophytes from the bladder, rectum, and colon.

Inflammation of the vulva and vagina can be produced by the passage through them of a septic discharge from a sloughing fibroid, by malignant disease of the cervix or uterine body, by the contents of a pelvic abscess or pus-tube, or by being constantly bathed with feces or urine escaping through fistulæ. Of the various micro-organisms that of gonorrhea is the most prolific cause of disease. In woman gonorrhea is far more dangerous than syphilis, for when infection enters the genito-urinary canal, the entire tract may become involved and she may suffer from chronic inflammation of the uterus, suppuration of the tubes, inflammation of the peritoneum and ovaries, as well as cystitis, ureteritis, and inflammation of the pelves of the kidneys. Not only does she lose her power of reproduction, through its influence, but she develops inflammatory conditions, which, if they do not effect a fatal termination cause such destructive changes in the pelvic organs as to necessitate their removal in order to prolong life or render it endurable. While the recurrence of gonorrhea may not in all cases cause sterility, its existence renders the soil favorable for the development of sepsis subsequent to abortion, parturition, or rough and unskilful manipulation. Careless examination, the introduction of the sound, and other intra-uterine manipulation without thorough asepsis are too frequently the causes of the renewal and extension of serious pelvic inflammation.

Acute exacerbations are readily produced by overexertion, fatigue, cold, or rough manipulation when the pelvic organs are the seat of chronic inflammation.

Characteristics of Inflammation. It should be well understood that inflammation, in the great majority of cases, is primarily a product of infection, and, consequently, is not necessarily to be regarded as a reprehensible process, but, on the contrary, as an effort to guard and preserve vital structures from injury and invasion. Its first aim, then, is defensive; the second, constructive and reparative. These processes are often so intermingled as to render differentiation difficult.

The defensive element is more marked in the acute process, and is associated with proliferation, degeneration, and destruction, dependent in degree upon the virulence of the infection and the capabilities of resistance. Efforts are set in operation to establish a retaining wall. Blood stasis, cell proliferation, and exudation occur; degeneration and destruction follow. Such a process causes pain, a burning sensation, elevation of temperature, extreme sensitiveness, swelling, and more or less constitutional reaction. The process may terminate in resolution or go on to suppuration.

Acute and chronic inflammations are ofttimes mere stages in the infective process, and the one insensibly fades into the other. In the latter, defensive action is slight and not marked by an extensive limiting wall. Naturally, the symptoms are less severe, and, as the constructive elements predominate, as seen in hyperplastic conditions, the neuropathic disturbances are more marked.

The inflammatory process may begin with a chill, or with repeated rigors, associated with elevation of temperature and with tenderness over the pelvic organs. This is often so great as to render the contact of the clothing or bed-clothes quite unendurable, especially when the peritoneum has become involved. Increased secretion and discharge is an invariable symptom, necessarily dependent upon the seat and character of the inflammation. Disturbance of the functions of the genital organs also occurs necessarily. In acute attacks the organs are so sensitive that a digital examination is frequently attended with agonizing pain.

The menses may be arrested (amenorrhea) or greatly aggravated (menorrhagia), while not infrequently there is profuse irregular bleeding (metrorrhagia). Increased or irregular flow is more likely to be associated with involvement of the peritoneum and cellular tissues, because the resulting exudate obstructs the pelvic venous circulation. The bleeding occasionally is internal. More frequently, however, there is a transudation of serum and plasma into the cellular tissues, which forms the condition known as parametritis or pelvic cellulitis.

230. Classification. Frequently inflammation will begin in one portion and rapidly involve the structures of the entire genito-urinary tract; therefore it is difficult to specify any particular organ as its primary site. Furthermore, in other cases the virulence of the micro-organisms may be so great and the defensive power of the patient so slight that general infection takes place, and localization, if it occurs, may be in organs remote from the site of original infection. The gonococcus is an example of the former, while infection with the streptococcus illustrates the latter. In the majority of cases inflammation preponderates in a portion of the genital canal or pelvic structure, and is named for the part mostly affected.

Inflammation	of the	vulva,....................	vulvitis.
"	"	ducts and glands of Bartholin,	Bartholinitis.
"	"	urethra,....................	urethritis.
"	"	bladder	cystitis.
"	"	vagina,....................	vaginitis.
"	"	uterus,....................	metritis.
"	"	tubes,....................	salpingitis.
"	"	ovaries,....................	ovaritis or oöphoritis

A still more minute classification of inflammation is made in relation to the particular structure or portion of the organ involved, as the mucous membrane, the muscular structure, or the periphery. Thus, with the vagina we may have an endovaginitis, a parenchymatous vaginitis, and a peripheral or perivaginitis. The uterus furnishes an endometritis, a parenchymatous metritis, a perimetritis, the last involving the peritoneal covering, and an inflammation of the cellular tissue, known as parametritis or, better, pelvic cellulitis. The tube is affected by endosalpingitis, parenchymatous salpingitis, and perisalpingitis. Inflammation of the serous covering of the uterus is perimetritis. It is, however, rare to find this portion of the peritoneum alone involved. More frequently, the entire pelvic peritoneum, including that of the uterus, broad ligaments, and tubes, is inflamed, so that the term pelvic peritonitis affords a more accurate description. Inflammation of the pelvic peritoneum rarely occurs without more or less inflammation of the cellular tissue. It cannot be denied that we may have cellular inflammation without very extensive involvement of the enveloping peritoneum. When this occurs, it is known as pelvic cellulitis.

231. **Vulvitis** (inflammation of the vulva), varies in degree from a slight erythema to a very severe and destructive involvement which may result in the formation of an extensive abscess, or in the destruction of a large portion of the labium. It is usually divided into simple or catarrhal, follicular, venereal, eruptive, phlegmonous, and diphtheric.

Causes. Vulvitis is generally produced by infection. Its development is favored by neglect of cleanliness. The decomposition of the sebaceous and sudoriferous glandular secretion, which, with desquamated epithelium forms the smegma, accumulates between the labia majora and labia minora and beneath the prepuce of the clitoris, will often cause an attack of inflammation similar to balanitis in the uncleanly male. In obese women the decomposing perspiration, mixed with vaginal secretions will keep the surfaces constantly irritated and produce an extremely offensive odor.

The tendency to inflammation is enhanced by the gouty, rheumatic, and scrofulous diatheses, and by intemperance in eating and especially drinking. Vulvitis is often produced by uterine and vaginal discharge, from malignant disease, or from pelvic abscesses which have opened into the vagina.

The continual soiling of the vulva with the urinary and fecal discharge associated with fistulæ is productive of vulvar inflammation and often erosion of the surfaces. Vulvitis is excited and aggravated by masturbation and excessive coition, and by pruritus accompanying the presence of pin-worms, ants, and pediculi. The various eruptive diseases, as eczema, herpes, acne, furuncle, warts, and venereal sores, are productive causes. A severe form of vulvitis is generally associated with eczema, and intense pruritus is caused by the presence of the torulæ cerevisiæ in diabetic urine. Inspection will reveal whitish tufts over the surface, which arise from the spores of the oïdium albicans. Severe vulvitis with eczema should always lead to examination of the urine in order to exclude the presence of sugar. Vulvitis is a frequent complication in the eruptive and infectious diseases of childhood, such as scarlatina and diphtheria. It may arise from the extension of inflammation from the anus or bladder.

Simple or Catarrhal Vulvitis. In the acute stage of vulvitis the labia minora, the clitoris, and the fourchet are swollen and thickened. The parts are red, angry, and dry. Later, they are covered with a profuse purulent discharge of an extremely offensive odor. This discharge is produced by an increased secretion from the sebaceous glands mixed with desquamated epithelium and pus-corpuscles.

Pruritus, as in all forms of vulvar inflammation, is a marked symptom, and is at times so severe as to prevent sleeping and force the patient to abjure society. The temptation to scratch or rub the parts becomes almost irresistible. The contact of the urine causes smarting or burning. As the disease becomes chronic, the surface is not so bright a red; it becomes abraded; at points, small ulcers form, the skin is greatly thickened, the papillæ become hypertrophied, bleed easily, and are red; often the surface presents points of excoriation, which extend upon the vulva into the groins and the inside of the thighs, when the itching is intolerable. The glands in the groin often become swollen, and may even undergo suppuration.

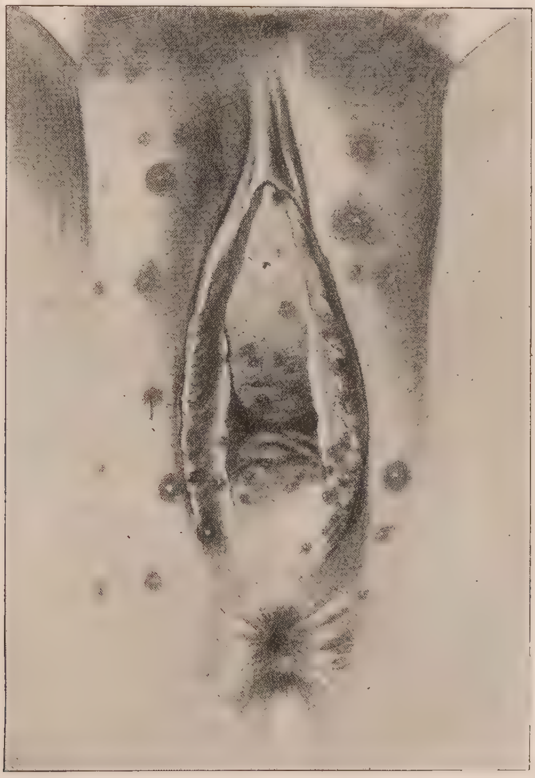


FIG. 307.—Follicular Vulvitis.

In follicular vulvitis inflammation is limited to the hair-follicles or originates in the sudoriferous and sebaceous glands. (Fig. 307.) The surface of the vulva is studded with small round protuberances the size of a millet-seed or hemp-seed. These elevations begin as papules, which may suppurate, forming pustules, which burst and shrivel, or they may remain as small indurations. The intervening skin is unaffected.

Venereal vulvitis is produced by gonorrhea, syphilis, and chancroid. The former is the most prolific source. *Gonorrheal vulvitis* is much more intense than the catarrhal. It involves particularly the vestibule and smaller labia. The latter are very red and edematous, while the external meatus of the urethra and the orifices of the ducts of Bartholin are generally red and swollen. Small excoriations which bleed easily occur frequently. The disease is attended with a profuse purulent secretion, in which the gonococcus is found. The microscope shows the subepithelial tissue to be exceedingly vascular and infiltrated with solid groups of round cells. The epithelium will be seen in varying stages of granular degeneration and desquamation. Gonococci penetrate the epithelium and are found in the underlying tissues. The inflammation extends to the vagina, not infrequently through the urethra to the bladder. Often Bartholin's glands are inflamed, occasionally resulting in abscess formation. Micturition is followed by intense burning.

Vulvitis due to syphilis occurs in the form of a single sore with indurated base and excavated surface, which is situated upon the large or small labium or in the neighborhood of the clitoris. In the secondary stage there are mucous patches similar to those found in the mouth.

Chancroids produce a more or less extensive ulceration, generally involving adjoining surfaces. Syphilis causes indurated enlargement of the inguinal lymphatic glands, while chancroid is characterized by their inflammation and suppuration, causing the condition known as buboes.

232. Eruptive Diseases of the Vulva. Skin diseases manifest the same characteristics when situated upon the vulva as in other portions of the body. The most important, because the most frequent, are eczema, erysipelas, and herpes.

Eczema generally begins upon the labium majus or upon the mons veneris, from which it extends to the thighs, perineum, anus, and over the buttocks. In the acute stage the surface becomes red and swollen, burns, and is covered with transparent vesicles the size of a pinhead. It is associated with fever, gastric irritation, and rheumatic symptoms, and becomes chronic by the end of the second week. Chronic eczema generally appears in the form of eczema rubrum, and the surface is covered with pus, dry scales, or crusts. Fissures form at the fourchet and anus and in the genitocrural folds. All the symptoms are greatly aggravated at the menstrual periods. Pruritus is intolerable. The occurrence of eczema of the vulva is generally associated with the appearance of the disease upon other parts of the body. It is a frequent consequence of diabetes mellitus, owing to the irritation of the sugar-containing urine. It is also an outcome of the rheumatic diathesis.

Erysipelas may occur as a primary affection of the vulva in the new-born, when it is a very serious disease, frequently proving fatal. It occasionally occurs periodically with the catamenia, or may even take the place of the latter. Its occurrence during the puerperal state is generally an indication of serious infection.

Herpes manifests itself by the appearance of small transparent vesicles, from the size of a pinhead to that of a pea, which may be few or multiple, discrete or confluent; rarely, as a single erosion of large extent. The advent of the disease is characterized by heat, smarting, and an area of redness, which is covered with agminated vesicles. These vesicles may fuse and form a large bulla. The vesicles dry; the edges of an ulcer are scalloped and its surface is covered with a crust, beneath which cicatrization is completed within from eight to fifteen days. The inguinal glands are engorged and painful, but do not suppurate.

Causes. Accidental herpes may be caused by syphilis, gonorrhea, filth, and constitutional conditions. Congestion is a predisposing cause. In some women it occurs each month two days in advance of menstruation; also during pregnancy.

Phlegmonous inflammation of the tissues may result from the catarrhal inflammation or may be the result of violence. It affects the deeper structures and subcutaneous tissues, resulting in serpiginous ulceration, which may form a permanent fistulous tract, or the inflammatory area may be so extensive as to cause the formation of an abscess.

Diphtheria may, but rarely does, affect the vulvar mucous membrane. The so-called diphtheric vulvitis is an exudation found upon lesions of the vulva and vagina, produced by parturition, and is the result of septic infection. Such exudations are found also in grave constitutional disorders, such as scarlatina, smallpox, and typhoid fever.

In a woman whom I saw prior to death from sepsis subsequent to the delivery of an intra-uterine sessile fibroid, the vulva, vagina, and uterus were lined with a diphtheric exudate.

Diagnosis, especially the differential diagnosis, of the inflammatory disorders of the vulva is of great practical importance. Gonorrheal vulvitis is evident from the greater intensity of its symptoms. It is characterized by an increased burning during micturition, profuse purulent discharge, and redness of the meatus and orifices of the ducts of Bartholin. It has a tendency to extend to the tubes, ovaries, and peritoneum, as well as an increased inclination to involve the urinary tract. Its recognition is rendered certain by the discovery of the gonococcus, and the known fact of exposure to the virus. The absence of the gonococcus is not proof positive against the specific character of the disease, as the germ may have disappeared. Late investigations seem to show that the gonococcus is capable of assuming amorphous forms and resuming its original form and virulence under irritation. Thus are explained the recurrences of the disease after a debauch, excessive venery, or exposure to cold in individuals apparently cured.

Vulvitis in the virgin from masturbation is suspected when the smaller labia and the space between them and the hymen are covered with small, pointed excrescences; the nymphæ are elongated; the clitoris or its prepuce is irritated; swelling of the shallow groove between the orifice of the urethra and the clitoris exists; clear, abundant secretion from the ducts of Bartholin occurs; and associated with these phenomena there is abnormal sensibility; exaggerated prudery; and distinct hysteric symptoms. Discontinuance of masturbation may be assumed when the hypertrophied nymphæ become soft and no longer show any indication of inflammation.

Eczema can be recognized by the similarity of its symptoms to those of the disease when it occurs in other portions of the body. If the surfaces are covered with whitish tufts, this should arouse suspicion of the presence of torulæ cerevisiæ, which is revealed by the microscope, and the presence of sugar in the urine. The urine should be examined in every case of eczema of the vulva. Herpes is frequently confounded with chancroid from which it is distinguished by its early history. The formation of a vesicle is followed by its rupture which leaves a raw surface without a thickened inflammatory base and without loss of substance. The burning or smarting is more acute and the inflammatory symptoms subside more quickly. The lymphatic glands of the groin may become inflamed, but do not suppurate. The duration of herpes is from eight to fifteen days. In chancroid the sore has an uneven, fissured base, the edges of which are sharply defined, and its surface is covered with a greenish discharge. It presents points of abrasion, shows an inclination to extend, and generally the apposed surface becomes inoculated. Bubo, or suppuration of the inguinal glands occurs.

Treatment. In all forms of vulvitis absolute cleanliness is essential. In the simple acute variety, absolute rest and the administration of salines are indicated. Tincture of aconite can be given in drop doses every one or two hours to decrease inflammation. In all varieties thorough local cleanliness must be observed. In the simple and follicular forms cleansing and isolation of the inflamed parts frequently will be sufficient to establish a cure. The cause of the inflammation, if possible, should be determined, and, when practicable, remedial measures should be directed to its removal. Vaginal discharge should be arrested, and the inflamed surfaces should be protected from its contact. The rheumatic, gouty, and scrofulous diatheses and improper habits must be corrected by proper hygienic and constitutional measures. The food should be carefully regulated and all stimulating and indigestible articles avoided. Alcohol in any form should be interdicted, excepting in the diphtheric and phlegmonous varieties. In the acute stages a bland diet or exclusive milk diet may be advisable.

The treatment of *catarrhal and gonorrheal vulvitis* is of great importance, as in the latter infection may lurk in the diseased tissues for years. Cleanliness is secured by the employment of the hot sitz-bath several times daily, by antiseptic fomentations, such as gauze pads moistened with sublimate solution, 1:2000 or 1:1000; carbolic acid, 1:20; boric solution, 1: 50; equal parts of boric-acid solution, and of a solution of subacetate of lead, or 5 per cent. solution of antipyrin, placed over the vulva and covered with oiled silk or rubber dam. In very acute conditions the distress will be more quickly ameliorated by the application of lead-water and laudanum which may be kept cold by an ice-bag placed over it. These applications, whether antiseptic or emollient, should be changed frequently, the parts protected from vaginal discharge by a tampon, and the inflamed surfaces painted several times daily with a solution of Monsell's salt, 1:8, in glycerin or 20 to 40 per cent. solution of argyrol; on each alternate day silver nitrate, gr. x to the fluidounce, or compound tincture of iodin in water, 1 to 2, should be used. Protargol, largin, argyrol, and argonin have been especially advocated as valuable in the gonorrheal form; alumnol in 2 per cent. solution has also been advocated. Ramon Guiteras highly recommends mercurol in 2 per cent. solution. These agents are more effective in the gonorrheal form. The sides of the vulva should be separated with absorbent cotton, surgeon's lint, or prepared cotton. After the subsidence of the more acute stage the surfaces should be dusted with zinc oxid, bismuth subnitrate, iodoform, boric acid and acetanilid in equal parts, lycopodium, starch, talcum, or one of the various combinations of these powders. Iodoform and tannin in equal parts are very efficient. Equal parts of alum and sugar afford relief in pruritus. Buboes and abscesses should be promptly incised and their cavities sterilized. In the former it is wise to dissect out the infected glands. In chronic vulvitis, astringents or caustics may be employed, the latter with the purpose of promoting sufficient metabolism to take up inflammatory exudate which has led to thickening of the tissues. Benzoated zinc ointment is a soothing application. The surfaces may be dusted with calomel or bismuth subgallate. Gonorrheal vulvitis is usually secondary. In chancroid the parts should be kept clean by frequent washing, the inflamed area isolated by gauze or lint, and drying powders should be employed, such as iodoform, iodoform and tannic acid in equal parts, aristol and desiccated alum, 4 to 1, calomel and zinc oxid, or bismuth subgallate and acetanilid. In herpes keep the surfaces clean and separated. Drying powders should be employed.

In *follicular vulvitis*, in addition to strong antiseptics, alkaline solutions are efficient. It may be necessary to shave the parts and to puncture and cauterize the individual follicles, or, in rare cases, to excise the affected surface. The ointment of ammoniated mercury, diachylon ointment, or 5:25 per cent. ichthyol in lanolin (1:8–1:4) may be useful. *Phlegmonous and diphtheric vulvitis* require cleanliness, antiseptics, removal of sloughing tissue, and, in the latter, cauterization of the infected surfaces with strong carbolic acid.

Eczema, when acute, must be treated with emollient applications, slippery-elm or starch poultices, and the surfaces should be carefully cleansed. The bowels should be regulated and constitutional measures employed for the correction of any disordered condition. When eczema is associated with diabetes, compresses of hyposulphite of soda, half an ounce to the pint, should be kept in contact with the inflamed surfaces. In chronic eczema the parts should be thoroughly washed with strong potash soap and hot water. By this measure all crusts and scales are removed. Where the surfaces are too much irritated, cracked, and fissured for this plan of treatment, a starch or slippery-elm poultice may precede it. After thoroughly cleansing the surfaces, the application of the following ointments will prove of value:

℞. Hydrarg. ammoniat.,.............................ʒss
Lanolin,.. ℥ij. M.
Ft.ungt.

℞.	Iodoform.,	ʒj	
	Zinc. oxid.,	ʒij	
	Lanolin,	℥iij.	M.

Ft. ungt.

℞.	Acetanilid,	ʒj	
	Menthol,	ʒss	
	Lanolin,	℥j.	M.

Ft. ungt.

Diachylon ointment or one of the tar preparations may be substituted. Irritation apparently due to vaginal discharge may be overcome by the use of a medicated tampon. The bowels should be regulated and constitutional measures employed for the correction of arthritic, scrofulous, or diabetic conditions, any one of which may be the cause of this distressing disorder.

233. Edema and Gangrene. *Edema* of the vulva is frequently associated with pregnancy. It is common in ascites from various obstructions of the circulation. It may follow labor or result from varix of the external pudic vein. When one side of the vulva only is involved, infection should be suspected. Incisions of the vulva or spontaneous fissures permit the fluid to escape but increase the danger of erysipelas. They may be followed by gangrene and sloughing of the labia. The swelling in general anasarca is great, and may render urination or the use of the catheter difficult.

A hard edema of one labium can occur from, and persist after, chancre. When it appears in the nymphæ or præputii clitoridis, it resembles elephantiasis. The condition is known as syphilitic hypertrophy of the vulva.

Gangrene of the vulva may be caused by traumatism, or septicemia, and occur in weak and scrofulous infants. This form of gangrene in young children is known as noma. It is infectious, and presents a reddened infiltrated labium and an ichorous discharge. A vesicle appears, which rapidly becomes gangrenous.

The treatment of edema is the same as that of the condition from which it arises. That of gangrene or noma consists in early excision, disinfection, and the exercise of measures to secure effectual nourishment.

234. Bartholinitis. *Inflammation of the glands of Bartholin* (known as the vulvovaginal, Duverney, or Cowper's glands) occurs in the racemose glands the size of a bean, situated in the labia majora at the junction of the posterior and middle thirds. The duct, two centimeters in length, opens in front of the hymen, with an orifice the size of a pinhead. Catarrh of these glands is rare, but hypersecretion is not infrequent. It is indicated by redness about the opening of the duct, which may be either dilated or closed, in the latter case forming a retention cyst. The secretion from these glands may be thrown off in paroxysms, not infrequently in nocturnal emission. The secretion is particularly discharged during erotic excitement.

Inflammation can occur in either the gland or the duct. It is generally due to specific infection, but may arise from streptococcic or staphylococcic forms. In severe cases it is apt to be a mixed infection. It is most generally due, however, to gonorrhea. Gonorrheal inflammation having been lighted up in the gland, it may subsequently remain dormant, and afford material which may not only infect the patient again, but others coming in contact with the secretion. Inflammation, according to its virulence, may either produce a cyst or result in the development of an abscess.

Cysts are either single or multilocular, ovoid, with a smooth surface, and seldom transparent; the contents are viscid and are colorless or yellow. From mixture with blood they may become chocolate colored. (Fig. 308.) The cyst varies in size from that of a nut to that of an egg, is generally unilateral, and is most frequently situated on the left side, elongated in the axis of the greater lip, and nearer the mucous surface. It seems elastic and compressible rather than fluctuating; gives rise to discomfort in walking and during coition, and can become inflamed and suppurate. Superficial cysts involving the duct may attain to the size of a nut; they are usually situated at the base of the labium minus, and may project into the vagina beneath the mucous membrane. A cyst of the gland is generally larger, deeper, and located behind the labium majus; it elevates both labia, and its duct is impermeable.

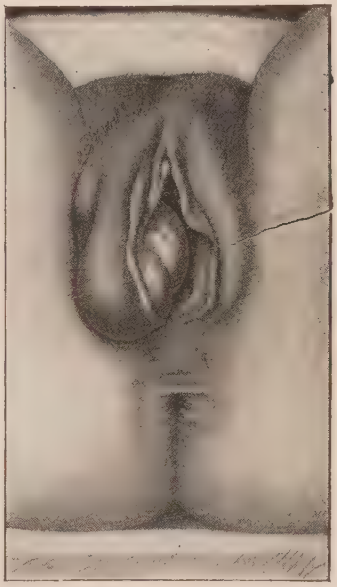


FIG. 308.—Cyst of Bartholin's Gland.

The diagnosis is readily determined. In either solid or fluid tumors fluctuation is absent, and the transparency is insufficient. But when the diagnosis is doubtful, it can be ascertained by puncture. Conditions with which it may be confounded are: first, sacculated cysts of old hernial sacs; second, hydroceles in the canal of Nuck; third, a cyst in front of a hernia. From hernia, which may be an epiplocele, an enterocele, or ovarian, it is distinguished by the absence of succussion in coughing and by the determination of the connection of the mass with the abdomen. Hydrocele frequently may be displaced by pressure, is a larger tumor, gives more sensation of fluctuation, and is more translucent. Abscess may be secondary to the cyst or may originate from primary inflammation. Swelling and edema are marked over the posterior part of the vulva and about the anus, and the pain is acute and lancinating. The patient may have more or less fever; frequently, the urine is retained; fluctuation is distinct, and, if the abscess is not opened early, its contents may escape through several openings; pus is abundant and fetid. Fistulæ may persist, and may result in a rectovulvar fistula, or a large ulcer may be present, associated with purulent secretion or a hypertrophic induration of the gland, with profuse discharge of milky, greenish pus. The gland is prone to invasion by gonorrheal inflammation and is a frequent source for unsuspected infection in men. It may be confused with anal abscess, phlegmon of the labium majus, or furuncles. In anal abscess there is more rectal disturbance, a more widely diffused inflammation, and the mass does not encroach to the same degree upon the labium. In phlegmon of the labium majus the inflammation is more external, and encroaches upon the cutaneous rather than upon the mucous surface. Furuncles are more sharply defined and present an indurated base.

Treatment. In early inflammation of the duct the pus may be evacuated by pressure and the gland injected with a two per cent. sterile solution of ichthyol, or a one per cent. solution of silver nitrate. The duct may be opened with a lacrimal knife, and a crayon of silver nitrate or a solution of zinc chlorid (1:50) may be introduced. In cysts, when the contents are evacuated by puncture, they quickly reappear. Obliteration of the cyst may be secured by injecting ten drops of a solution of zinc chlorid (1:10) after the contents have been removed by aspiration, or the cyst may be incised and packed with iodoform gauze. A preferable procedure would be extirpation. In order to overcome the difficulty of removing the cyst when collapsed, it may be punctured, emptied, irrigated with hot water, and injected with melted paraffin, and the latter hardened with ice, after which the mass thus formed is easily dissected. The wound produced by the removal of a cyst should be closed with sutures. In abscess early free incision at the junction of the skin and mucous surface is important. To extirpate the gland, wash the cavity with carbolic solution and pack with gauze. In fistulæ it may be wise to extirpate the gland, dissect out the fistulous track, and close the cavity with catgut sutures.

235. **Pruritus vulvæ** is a symptom of all forms of inflammation of the vulva. It results from the presence of pediculi, pin-worms, eczema, trichiasis; from hemorrhoids, disease of the kidneys, ureters, bladder, and urethra; from congestion of the pelvic organs and masturbation; and from acrid vaginal discharges. It is associated with pregnancy, menstruation, the menopause, old age, the gouty diathesis, and general nervousness. It is directly caused by lice, acrid discharges, and diabetes. In addition to the sources given, there is a form of pruritus in which the origin remains undetermined. This is designated as an idiopathic pruritus. It is, however, very questionable whether careful examination will not disclose a demonstrable cause of the disorder. Seeligman, in an investigation of a large number of cases, found in all a diplococcus which resembles the gonococcus in appearance, but differs from it in its process of growth, and, besides, it takes the Gram stain.

Symptoms. Pruritus produces intense itching, and, as a result of the scratching induced, excoriations are present. The hair is often worn off the mons veneris. The patient avoids company, becomes melancholy, has loss of appetite and sleep and increased sexual desire, masturbation is excited, and she may become insane. Itching is continuous or occurs only at intervals; it is increased by heat and is much worse at night or following any exertion. The relation of masturbation to pruritus is not determined readily. The habit produces certain abnormal alterations as a result of the irritation: changes in the endometrium, glandular hypertrophy, ovarian irritation, increase of secretion, irritation and manipulation of the vulva. A bad circle is engendered; irritation causes masturbation, and this aggravates the inflammation. There are cases, however, in which most careful examination fails to disclose inflammation of the vulva as a source of the intense pruritus. These conditions are known as idiopathic pruritus, and are supposed to be due to nerve irritation. Such cases do not properly belong under the term inflammation of the vulva, but they are so rare, and the symptoms are so prominently associated with vulvitis, that their consideration seems more appropriate here.

Prognosis. The relief of the condition depends entirely upon its cause. In some cases it is exceedingly obstinate. The removal of the cause, as filth, pediculi, or pin-worms, results in the removal of the disorder. The prognosis in masturbating alterations is by no means favorable. It may be exceedingly difficult to overcome the evil habit.

Treatment. The first aim in the treatment should be to discover and remove the cause. Upon the recognition of pediculi the parts should be shaved, and blue ointment should be applied. A strong sublimate solution, however, is the most effective agent. The surfaces should be painted with a solution containing one grain of corrosive sublimate to the ounce each of alcohol and water. Unless the parts are shaved, this application must be made repeatedly, for it is necessary to destroy not only the lice which are present, but also the spores. If the pruritus arise from the action of the ascarides scabiei (the itch insect), sulphur ointment or one consisting of thirty-five grains of betanaphthol in one ounce of vaselin is an efficient application. Of course, in the latter condition, the application must be made to the entire body.

The methods of treatment of eczema and vulvitis have already been given. When it is evident that the pruritus has been produced by pin-worms, the parts should be kept clean and the patient given fluidextract of senna and spigelia in half-ounce doses; a rectal injection of infusion of quassia, two ounces to the pint; half a grain of sublimate to eight ounces of water; an injection of lime-water, or a suppository of five grains of santonin, are all efficient measures. Hemorrhoids, glycosuria, and other causes should be recognized and treated. The diet is important. Alcohol and spiced food should be excluded. The use of coffee will often cause severe pruritus. Milk is an excellent basis for the diet. The general health should be carefully considered. Tonics, such as arsenic and quinin, should be administered. When the patient is unable to rest, sleep should be secured by the administration of bromid of potash, ʒj–ʒij daily, tincture of cannabis indica, gtt. xx-xxv, thrice daily, or a capsule containing camphor gr. ss chloretone gr. x at night. If necessary this may be repeated every hour for three doses. When the measures just named are insufficient to secure sleep, sulphonal, trional, or veronal should be given in preference to opium. Local vaginal injections of hot water; carbolized, sublimated, or borated cotton tampons; or fomentations of lead-water and laudanum can be employed, or a saturated solution of bromid of potash may be painted over the surface several times daily. Local applications of chloroform in glycerin (1:8), hydrocyanic acid, two or three drops to the ounce, or a one per cent. solution of cocain may be used. A solution of carbolic acid, or a strong solution of silver nitrate, followed by cold compresses, may be employed. Seeligman advocates the use of an ointment containing 10 per cent. of guaiacol in vaselin, and when this is not effective, it should be increased to 15 to 20 per cent. An ointment containing acetate of lead, chloral, camphor, or chloroform (a dram to the ounce), combined with vaselin, menthol, or a solid stick of nitrate of silver, is advised. The following formula may be employed:

℞. Menthol, ... ʒss
Lanolin, ... ℥j. M.
Ft. ungt.

In very obstinate cases the affected skin may be excised. Tampons containing equal parts of sulphurous acid and boroglycerid sometimes afford relief. The irritated surfaces may be painted with a solid stick of silver nitrate or a galvanic current can be employed. The employment of the *x*-rays has been advocated. The resort to tobacco smoking has afforded relief when all other means have failed.

236. **Kraurosis vulvæ** is an obscure form of disease, first recognized by Breisky. It consists of an atrophy of the smaller labia. (Fig. 309.) The skin of the vulva undergoes essential changes. The capillaries of the corium become dilated, the rete mucosum gets thin and disappears, while there is a substitution of a thick horny layer of epithelium, which lies directly upon the corium. The papillæ disappear, the undulating character of the skin is lost, and it becomes stiff and sclerosed, with here and there points of small cell infiltration. As the disease progresses the sebaceous and sweat-glands are entirely destroyed. It is called chronic inflammatory hyperplasia of the connective tissue with inclination to cicatricial shrinking (Peter).

Mars divides kraurosis into two stages: (1) The stage of edema, characterized by more or less inflammatory reaction; (2) the atrophy of elastic and connective-tissue skin layers with the formation of scar tissue; but Heller says it may be independent of the inflammatory process. He attributes it to some chemic irritation or a direct disease of the medullated nerves, which leads to atrophy of the muscles, fat, and glands in the deeper layers of the skin, while a hypertrophic process, especially a hyperkeratosis, occurs in the superficial layer.

Causes. The cause is unknown. It has been attributed to gonorrhea and pruritus. A preceding inflammatory stage exists (Martin). Breisky found it more frequently in the pregnant; Martin and others, in the non-pregnant.

Symptoms. The surfaces become contracted, presenting a smooth, cicatricial appearance, devoid of glands, with reddened, inflamed points, not fully cicatrized. Pruritus is intense and causes severe burning and pain upon urination. The surface is dry, smooth, contracted, often fissured. The labia minora entirely disappear, and the clitoris becomes a mere papule. The vulvar orifice is contracted, and causes coition to be exceedingly painful, often impossible. Childbirth results in extensive laceration.

Diagnosis. The lesions induced by scratching in this disease should be distinguished from that of onanism and pruritus. The gratification induced by masturbation and the absence of cicatricial changes distinguish it. In pruritus the tears and superficial injuries are more marked and the disease is not so general, while in kraurosis the border of disease is more sharply defined toward the healthy skin.

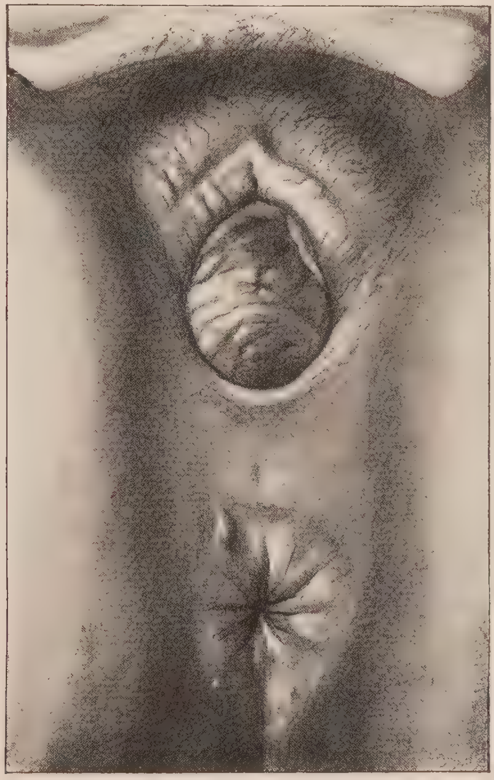


FIG 309.—Kraurosis Vulvæ.

Prognosis. Its spontaneous recovery is very doubtful. That carcinoma occasionally develops from it is exceedingly probable.

Treatment. The disease is exceedingly intractable to treatment. The application of cocain adds to the discomfort. Relief has been afforded by applications of strong carbolic acid, or of pledgets wet with a solution of lead acetate. The thermocautery has been applied. The most effective treatment is the excision of the affected tissue, accomplishing union of the healthy tissue by sutures. Care must be exercised to prevent narrowing of the urethra.

237. **Urethritis** is an exceedingly painful, but not an unusual, complication of pelvic abdominal procedures where a catheter has been employed.

Varieties. It may be manifest as a simple hyperemia, an acute catarrhal urethritis, a chronic interstitial urethritis, or a granular or follicular urethritis. Associated with the urethral inflammation ulceration, fissures and a sacculated condition of the urethra occasionally occur.

Hyperemia may result from injury during a difficult labor; from uterine displacement and uterine growths affecting the pelvic circulation; from varicose veins, irregular urination, excessive coitus, or long-continued irritation. Probably the most frequent cause of hyperemia, which may continue until inflammation results, is the repeated use of the catheter. So probable is such a result that the majority of operators prefer, if possible, to have the patient evacuate the urine unaided. When the use of the catheter is necessary, the operator should have the nurse introduce the instrument for the first time in his presence, so that he can observe what precautions she employs and determine the ease with which she can accomplish the procedure. The instrument should never be introduced by touch, but always by sight. The vulva and the vestibule are generally covered with discharge, which is filled with micro-organisms capable of producing serious discomfort when carried into the urethra and bladder.

The labia minora should be separated and the vestibule sponged with absorbent cotton saturated with an antiseptic solution. The instrument, preferably of glass, should be perfectly smooth, with no rough or cutting edges. It should be boiled, kept in an antiseptic solution, and previous to its use washed with sterile water. It is then anointed with carbolized vaselin and carried by gentle pressure upward and backward, without exercising any force. If the passage of the catheter is obstructed, withdraw and reintroduce it, as the instrument may have entered one of Skene's follicles.

Even with the exercise of every precaution the urethra so often is irritated by the frequent introduction of the catheter that the patient may suffer more distress than from the condition for which the operation was performed. Consequently, whenever the patient can evacuate the bladder unaided, she should be encouraged to continue to do so, as the contact of healthy urine with a plastic wound, if the precaution is observed to irrigate the latter immediately, is less harmful than frequent catheterization would be.

In operations upon the bladder which require the urine to be evacuated frequently, a self-retaining catheter should be left in place several days. (Fig. 235.) A soft-rubber instrument with a flange upon its vesical end is most serviceable. It can be plugged, permitting the urine to collect for two or three hours. It should not be permitted to remain longer than forty-eight hours without removal and careful cleansing.

The ordinary glass catheter, with a long rubber tube attached, in my experience, does equally well.

In acute catarrhal urethritis the mucous membrane becomes thickened; its papillæ are hypertrophied and are covered with an imperfectly developed epithelium. At points the latter is desquamated and the papillæ are enlarged. This may result in the formation of a polypoid mass, which projects from the surface frequently by a pedicle—the urethral caruncle.

The acute disease may arise from long-continued and repeated hypermia or from traumatism, but it most frequently results from gonorrheal infection. The urethra is often the first point affected.

Symptoms. The onset of the acute attack is at first made known by itching or smarting of the urethral orifice, as the contact of the urine gives a sensation of a hot scalding liquid and urination is followed by intense burning along the course of the urethra. The meatus becomes red and swollen, then dark red and pouting. It is tender to the touch, and pressure along the urethra causes a few drops of mucopurulent or purulent secretion to be discharged. If the disease does not extend to the bladder, the symptoms soon subside or disappear.

Diagnosis. The condition should not be confounded with cystitis. Urination is not frequent. The pain and distress are associated with micturition, especially in getting the urine started, while in the intervals there is comparative relief. The tenesmus of urethritis can be controlled; it is attended with scalding, but is relieved by urination. In cystitis the tenesmus is uncontrollable, unrelieved by urination, and there is no urethral burning.

Chronic catarrhal urethritis is very generally an interstitial inflammation. The membrane is thickened and the canal narrowed, not infrequently permanently so, which results in a stricture.

Symptoms. Urination is frequent. Temporary retention of urine may, however, be caused by a spasmodic stricture. The latter is greatly aggravated by frequent coition or prolonged exercise. The thickening of the urethra is apparent upon passing the finger down its course along the anterior wall of the vagina. A small sound can be passed through the urethra, while the introduction of a large one meets with resistance and produces severe pain.

Follicular inflammation involves the follicles about the orifice of the urethra and Skene's glands. The latter are two tubules which will admit a No. 1 probe (French scale), and are situated in the floor of the female urethra, extending upward from the meatus about one or two centimeters. In the normal condition the orifices of the tubules are three millimeters within the meatus, but with the urethra slightly prolapsed and the meatus everted, the orifices may be exposed to view. The upper ends of these canals terminate in a number of divisions, which project into the muscular wall of the urethra. (Fig. 310.) These tubules occasionally become so much enlarged as to permit the introduction of a small catheter. If such an instrument were forcibly introduced, it would tear through the tubule and establish a false passage. Such a passage might enter the urethra or pass beneath it into the tissue and thus enter the bladder. In one patient under my observation the external orifice closed, these ducts formed cysts so large as to project bebeyond the meatus, and nearly a drachm of mucopurulent fluid was discharged from the two. Follicles and tubules about the urethral orifice may become inflamed, with the consequent discharge of mucus and pus. The mucous membrane may become thickened or the orifices closed. The latter will result in the formation of small cysts.

The symptoms are great tenderness; discomfort in sitting, standing, or walking; dyspareunia; stinging pain; a sensation of heat; and frequent and painful micturition. The orifice of the meatus is partly everted, with red, puffy folds, which simulate caruncle. There is erosion of the labia minora and of the edge of the meatus. A few drops of purulent discharge can be extruded by pressure along the urethra.

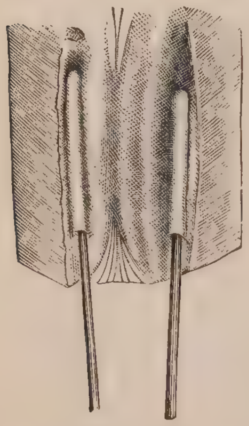


FIG. 310.—Urethra Laid Open with Probes, Distending Skene's Glands. Posterior Wall Divided. (*Byford, after Skene.*)

Ulceration is produced as a result of traumatism, from calculi, unskilful use of the catheter, specific infection, or the presence of diphtheric or venereal poison.

During the passage of a calculus or while in labor, injury, laceration, or overdistention of the middle portion of the canal occurs, with contraction of the meatus. A small quantity of urine and mucus is retained, which decomposes, and results in the development of inflammation and in the production of a condition simulating an abscess.

Symptoms. The most prominent symptom is dysuria, which becomes chronic. The meatus is large, of a deep-red color, granular appearance, and sensitive to pressure. The passage of an ordinary sound is readily accomplished, but is attended with pain. Sometimes a drop of blood is discharged. The sacculated form is associated with a copious discharge of pus, particularly when pressure is made along the urethra. Even when the discharge of urine is perfectly clear, pressure will cause a considerable discharge of pus.

Vesico-urethral fissure holds an intermediary position between cystitis and urethritis, and strikingly resembles both. Its cause is undetermined. The fissure is situated at the internal meatus, and resembles a crack in the lip or an ulcer similar to that which is found in fissure of the anus. The fissure is usually considered as being situated in the neck, but, as a rule, two-thirds of it is in the urethra. Only the upper end of it extends into the bladder. It may occur at any part of the circumference of the urethra, but, according to Skene, it is in the majority of cases situated upon the right side. In length it is from six millimeters to one centimeter, and is from two millimeters to four millimeters in width at the widest part. It is deeper at either end. The deepest portion, yellowish gray in color, resembles an indolent ulcer, while its edges are red and inflamed. Through an endoscope it looks like a fresh tear, the edges of which are abrupt, elevated, and indurated. Its situation explains the attendant discomfort. In any other portion of the urethra it produces little inconvenience beyond a smarting sensation, but at the junction of the bladder and urethra it is subject to constant though slight pressure, which causes severe and continuous pain. The portion of the fissure extending into the bladder is exposed to irritation from contact with the urine, producing a constant desire to urinate, a sensation of burning at the neck of the badder, acute pain during and immediately following micturition, and severe tenesmus, causing the patient to continue straining efforts after emptying the bladder. The pain and burning immediately following micturition are often intense. Subsequently, it partly subsides, to return with the accumulation of a small quantity of urine. If the patient resists the inclination to urinate, the distress is greatly aggravated.

Diagnosis of Urethral Inflammations. The recognition of inflammation of the urethra is often difficult, because it is frequently complicated by inflammation of the bladder. Acute catarrhal inflammation of non-specific origin usually begins gradually, and is often preceded by uterine or vesical symptoms, while the gonorrheal variety appears abruptly, and is preceded or attended by acute vaginitis or vulvitis.

In both varieties urination is painful. Sharp scalding is produced by urine passing over the inflamed surface, but the desire to urinate is not so frequent or urgent as in cystitis. Often the urine is long retained, for fear of the pain occasioned by its evacuation, or started with difficulty, because of the sensation of scalding as the urine comes in contact with the inflamed surface.

Slight hemorrhage is occasionally noticed, the urethral origin of which is evident as the blood is unmixed with urine, a few drops oozing from the external meatus subsequent to urination. Urethral discharge is common, and, except just after urination, it can be extruded from the orifice by pressing upon the urethra from the vagina. Microscopic examination of the discharge may reveal the presence of gonococci, which makes the nature of the urethritis absolutely certain. However, the absence of this germ cannot be accepted as positive proof that it is not of gonorrheal origin. To exclude cystitis, introduce the catheter, allow some urine to escape to wash away the mucus introduced with the instrument, and retain the remainder, which will be found free from sediment. Pressure along the urethra from the vagina is painful in urethritis, while pressure over the bladder, unless complicated by cystitis, is not distressing.

In chronic urethritis the urethra is less sensitive, but it will be noticed as a somewhat thickened cord when examined from the vagina.

In granular erosion the pain during micturition is excruciating, it is associated and followed by tenesmus, and is more likely to be found in old persons.

The character of the disease is assured by its history and by the appearance of the urethra. Fissure, urethritis, and cystitis are distinguished the latter especially, by examination of the urine. Fissure alone is free from all the products of cystitis. Urethritis is excluded and the fissure detected by the use of the endoscope. The endoscope is more satisfactory than the ordinary open instrument, because it exposes the surface of the fissure, which would be overlooked with the open end instrument. As a rule, the pain in fissure is more circumscribed than in either urethritis or cystitis, and in many cases more acute.

The maximum of pain in fissure follows urination, while in cystitis there is a sense of relief. In urethritis the most severe pain occurs during the act of urination. It then subsides slowly.

Treatment of Urethral Inflammations. In urethral hyperemia render the urine bland and unirritating by the exclusion of acids and stimulants from the diet and by the administration of saline cathartics. Relief is enhanced by giving ten grains of benzoate of ammonia or benzoate of sodium every three or four hours, and by the employment of hot hip-baths and hot vaginal douches.

Acute urethritis, whether specific or otherwise, should be treated upon the same principles as in gonorrhea of the male. The treatment consists of constitutional and local measures. Internally, salicylic acid in ten-grain doses lessens the discharge. Salol, two grains every two hours with a glass of hot water, renders the urine bland and unirritating. Douche the urethra frequently with hot water through a reflux catheter (Fig. 311), so that the current flows back from a cap on the end of the instrument. Later, inject from one-half of one to one per cent. of carbolized water; sublimate, gr. 1/40, to aq., f℥j; silver nitrate, gr. 1/6, to aq., f℥j; or zinc chlorid, gr. x, to aq. f℥j; preceded, when injection is painful, by the instillation of a solution of cocain with a pipet.

In making urethral applications it should not be forgotten that the canal will hold but from ten to fifteen drops. If a larger quantity is thrown in by the pipet, it flows into the bladder. A strong solution of silver nitrate (gr. x–xv to aq. f℥j) may be applied by a pipet or applicator. The same quantity of a twenty per cent. solution of argyrol may be employed frequently with very little discomfort and with very beneficial results.

Internally may be administered those remedies which will have an inhibitory influence through the urine. These so-called blennorrhagic remedies are: copaiba, cubebs, sandalwood oil, urotropin, aminoform, helmitol, and thyresol.

The itching of subacute and chronic urethritis may be alleviated by applications of different combinations of chloral or hydrocyanic acid, as in the following prescriptions:

℞. Chloral,.................................... ℈ iv
Lanolin,.................................... ℥j. M.
Ft. ungt.

℞. Chloral,
Camphor,..................................āā gr. xxx
Lanolin,.................................... ℥j. M.
Ft. ungt.

℞. Acid. hydrocyan. dil.,	ʒj	
Plumbi acet.,	gr. xv	
Glycerin,	f℥j.	M.

These remedies may be brought in contact with the affected surface by the applicator. A suppository or bacillum of cocain in cacao-butter, or in combination with lead acetate, will give relief. These bacilla should be introduced into the urethra two or three times in the twenty-four hours, preferably after urinating. In prolonged chronic disease which has resulted in thickened walls and a more or less contracted canal, the dilatation of the urethra by bougies once or twice weekly will be beneficial.

The bougie may be anointed for introduction with mercuric oleate, the official ointment of mercury, or any other medicinal agent which will have a beneficial influence upon the mucous surface. M. Julien, of Paris, applies ichthyol by dipping into it a cotton-wrapped probe, which is passed and repassed into the urethra several times. This agent has a destructive influence upon the gonococcus.

Granular erosion is best treated by brushing pure carbolic acid or silver nitrate (gr. xv to aq. f℥j) over the surface. This should be repeated in eight or ten days. The urethra should be dilated previously. Following the subsidence of the acute symptoms, a few drops of a solution of zinc sulphate, gr. iv, fluidextract of hydrastis canadensis, f℥j, aq., f℥iij, may be used twice weekly with a pipet. Mercurol, 2 per cent. solution, has been found very serviceable.

In fissure, instillations and injections do harm by increasing the spasmodic contraction of the bladder, and they add greatly to the discomfort of the patient.

A fissure may be exposed by a fenestrated speculum, and dusted with calomel, finely pulverized iodoform, or bismuth subnitrate, or the mitigated stick of silver nitrate may be employed. Incision of the fissure, as performed in anal fissure, is successful. The urethra should have been dilated previously. Dilatation is one of the most effective methods of treating fissure. The precaution must be exercised, however, not to overdilate the urethra and thus produce permanent incontinence.

Follicular urethritis is most effectively treated by splitting up the tubes their entire length. This may be done with the thermocautery, or they may be cauterized with carbolic acid and subsequently treated with milder agents, as in urethritis. In such cases, however, splitting up the canal is a prerequisite to cure.

238. Cystitis is an inflammation of the mucous membrane of the bladder, and may be either *acute* or *chronic*.

Etiology. The bladder is in intimate muscular relation with the uterus, as well as dependent upon the same nerve centers and ganglia for its nervous distribution. A portion of the bladder lies in direct contact with the cervix, but in closer relation with the vagina. It is not surprising, then, with such intimate relations, that the condition of the bladder should be affected by disorders of the uterus.

Inflammatory conditions of the bladder, if they have not originated from disorders of the uterus, are aggravated thereby. The symptoms of cystitis are more marked during menstruation and greatly aggravated by metritis. Vesical symptoms are engendered by uterine and vaginal displacements, by subinvolution and hypertrophy, by tumors and pregnancy, by pelvic cellulitis, and pelvic peritonitis. The train of phenomena thus engendered may be enumerated as: difficulty in evacuation; retention and decomposition of the urine, producing irritation, and finally cystitis. Cystitis may be secondary to inflammation of the kidneys, ureters, or urethra. Chemic modifications of the urine may result from indiscretions in diet, from the administration of irritating drugs, or from affections of the central nervous system. Inflammation is produced by traumatisms, injuries from the introduction of a catheter, or the presence within the bladder of a rough calculus.

Without doubt, the most frequent cause of cystitis is infection. This may result from the deposition of bacteria by the blood, from the extension of inflammation from neighboring organs, or the introduction of infection by way of the urethra. The infection is generally introduced into the bladder from the employment of the catheter. A violent form of cystitis is produced by retention of urine. A pregnant retroflexed uterus which has become impacted in the pelvis, by pressure upon the neck of the bladder, not infrequently leads to gangrene and desquamation, or to separation *en masse* of the entire vesical mucous membrane. Neoplasms, such as cancer, tuberculosis, polypi, and villous tumors, will usually excite a cystitis.

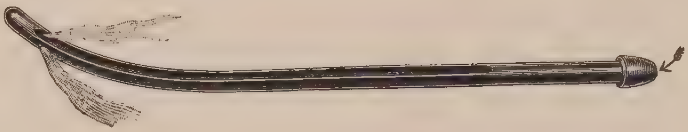


FIG. 311.—Reflux Catheter.

Pathologic Changes. The mucous membrane becomes injected, particularly about the orifices of the ureters and internal meatus. As the inflammation progresses the entire mucous membrane is swollen and becomes a bright red. The epithelium is desquamated and patches of ulceration or hypertrophied papillæ appear, which bleed easily. Abscesses develop in the vesical wall. The micro-organism most frequently found is the bacillus coli communis. Disease is also induced by the staphylococcus, the gonococcus, and the bacillus tuberculosis.

Symptoms of Acute Cystitis. Acute inflammation of the bladder is characterized by painful micturition; frequent desire to void urine, with only a few drops discharged at each attempt; severe vesical, and frequently rectal, tenesmus; a sensation of fullness or weight in the hypogastrium; shooting pains in the perineum and anus; and a burning, lancinating pain, like a hot iron, in the urethra. These attacks may be almost continuous, or may, after a time, subside, to recur again in an hour or so. Examination by touch, whether over the abdomen or by the vagina or rectum, is extremely painful. The urine is scanty, highly colored, and becomes cloudy after standing. In very severe attacks the urine becomes a dark red color and contains blood and pus-corpuscles and uric-acid crystals.

Constitutional disturbances are marked. These are nervous excitement, insomnia, and anorexia, followed by emaciation and loss of strength. Uncomplicated vesical inflammation does not cause elevation of temperature (Guyon). Partial or complete retention of urine is frequent. Paroxysmal pain results from vesical distention, and there may be frequent evacuation or continuous dribbling of urine without at any time emptying the bladder—an evidence of overflow known as the incontinence of retention. The course and duration of the disease are variable: it may subside in a few days or may continue alternately better and worse for weeks.

Symptoms of chronic cystitis are less pronounced, though similar to those of the acute disease. Micturition is frequent and painful, often difficult. The pain is pronounced at the beginning of the evacuation, thus leading to delay in starting. Exposure to cold, dampness, changes of clothing, indiscretions in diet, or constipation lead to acute or subacute attacks. The urine, after standing, becomes cloudy, and contains blood and pus-corpuscles, mucus, and uric-acid crystals. If drawn with the catheter, it is at first clear, then turbid, and toward the last pus apparently is discharged. The microscope reveals leukocytes, epithelial cells, tissue débris, and salt crystals. When the urine stands, it becomes alkaline, and bacteria in abundance are found.

Constitutional Condition. The patient is easily fatigued, has no appetite, loses flesh, develops a cachexia, has repeated inflammatory attacks associated with fever, repeated chills, a more or less continuous diarrhea, profuse sweating, and, finally, a fatal termination results. Such a train of symptoms and such a termination indicate the presence of an infectious pyelonephritis as a complication.

Cystitis of gonorrheal origin is produced by the extension of gonorrheal infection from the urethra, possibly through the careless employment of the catheter, but more frequently from the continuation of urethritis to the bladder. Its principal symptoms are frequent micturition, agonizing pain in the acute stages, associated with changes in the quality of the urine; hematuria is a common symptom, but is rarely profuse. These symptoms do not occur in the early stage of the infection. The disease is then generally much milder, characterized only by tenesmus. In the mucopus of the urine, from the associated urethritis, the gonococcus may be found.

Tubercular cystitis causes symptoms very similar to those produced by inflammation from gonorrhea and the irritation of calculi. Hematuria is a symptom in all varieties, but differs in tuberculosis. It appears early in the disease, and the blood is generally mixed with the last drops of urine. The bleeding ceases as the disease advances. In common with other vesical inflammations, pain, urethral spasm, and retention and incontinence of urine are marked.

Diagnosis of cystitis is not difficult. The frequent micturition, pain, alkaline reaction of the urine, large quantity of sediment, and mucopurulent appearance are ample evidence. In cystalgia and functional diseases of the bladder the urine will be found clear. Probably the greatest difficulty will be experienced in differentiating pyelonephrosis which may be the cause of the cystitis. The prognosis and method of treatment must depend upon the accurate determination of the structures involved.

The existence of pyelonephrosis is recognized by finding the urine unaltered after irrigation of the bladder, while in cystitis it becomes clear. The condition of the urine from each kidney is recognized by securing the urine separately through catheterization of the ureters or by the employment of the Harris segregator.

The careful investigation of the urine will often be sufficient to determine the diagnosis. Albumin is contained in the urine in either cystitis or pyelitis, but in very slight amount in the former, while it is present in quite large proportions in the latter.

The presence of a proportionately great abundance of albumin in the urine, associated with pus, should be considered as indicating the presence of renal disease. The most frequent cause is tuberculosis. The diagnosis of tuberculosis of the urinary tract is determined by the presence of the tubercle bacillus in the urine. However, Dr. Joseph Walsh, of Philadelphia, associated with Dr. Flick in his investigations in tuberculosis, informs me that the tubercle bacillus is found more frequently in the urine of the tubercular patients than is generally supposed. The great majority of these patients will be found not to have a tuberculosis kidney, though they will show a catarrhal condition of the kidneys, which is manifested by pains or aching in the bones, and by the presence in the urine of epithelial or granular casts, pus, and sometimes albumin. The bacilli may be found in the urine without any inflammatory symptoms. In sixty nonselected tuberculous patients whose urine Dr. Walsh examined, the bacilli were recognized in forty-four; in thirty of these the disease was in an advanced stage; in ten it was considered marked, and in four, only incipient. In patients in the advanced stages of the disease it is rarely that the bacilli will not be found in the urine. In five of the forty-four cases above cited tubercle bacilli were found in the urine, but not in the sputum, though the presence of a pulmonary lesion was recognizable. I have quoted Dr. Walsh fully, because his investigations seem to demonstrate that the presence of tubercle bacilli in the urine cannot be accepted as evidence of the existence of a true renal lesion. The usually recognized difficulty of finding the bacilli in the urine is my justification for quoting here Dr. Walsh's method of examination:

"Six fluidounces of urine are centrifugated in a water motor centrifuge; the sediment is then poured on one or two cover-glasses and allowed to dry thoroughly (twenty-four to forty-eight hours). The process is complicated by an excess of the crystalline sediment, which may render it impossible to find the micro-organism. In such cases, therefore, the sediment secured by centrifugation should be dissolved in water, a weak nitric acid, or a caustic potash solution, and again subjected to the centrifuge. In rare cases the sediment may resist any one or all of these solutions. After drying, it is fixed to the cover-glass by passing the latter through a flame two or three times, repeating this procedure twice, at intervals of a minute or two. The procedure for determination of the bacillus in urine requires more heat than the corresponding examination of the sputum. Even after the procedure for fixing given, the sediment will occasionally be washed off by the running water and the specimen thus destroyed.

"The specimen is stained with carbol-fuchsin for three to five minutes or longer, washed in turn with 95 per cent. and absolute alcohol for one to three minutes, decolorized, and counterstained with Gabbet's solution. The greater number of foreign elements in the urine, some of which hold the fuchsin, makes a larger experience necessary for the recognition of the bacilli than is requisite in sputum.

"The organisms must be absolutely typical to render the diagnosis certain."

In examining over the abdomen of a patient suffering from tuberculous cystitis, greater pain is experienced by suddenly withdrawing the hand pressure than is produced by deep palpation. A cystoscopic exploration of the bladder will reveal the extent of involvement and amount of tissue destruction. Tuberculous cystitis may supervene upon the gonorrheal, without cessation of the latter. The bladder wall is thickened with masses or projections from the surface. These may break down in extensive ulceration, or may be manifest in a single ulcer.

Primary vesical tuberculosis is manifested by a very irritable bladder, frequent and painful micturition, followed by the passage of a few drops of blood. Such symptoms may subside, to be followed by an aggravated attack. The presence of pus in the urine indicates preëxisting disease, which may have been unsuspected. The progress of the disease is more rapid when complicated by the discharge of pus, the presence of a fistula, or the existence of pyelonephritis. The last complication should be suspected when the urine shows the presence of a large pus sediment, inordinate quantities of albumin, and the patient gives a history of incontinence of urine and repeated exacerbations of high temperature. Polyuria is a most constant symptom of urinary tuberculosis.

Gonorrheal cystitis is associated with evidences of infection of other portions of the genito-urinary tract, particularly the urethra, glands of Bartholin, cervix, and pelvic organs, which have preceded the vesical disease. The gonococcus can generally be found.

A form of inflammation of the bladder, known as membranous cystitis, is a condition in which there is more or less extensive exfoliation of the bladder-wall, as in pseudomembranous, gangrenous, croupous, or diphtheric inflammation. It is always secondary to overdistention of the bladder from retention of urine. The mucous membrane is anemic during distention, but upon the removal of the bladder contents it becomes acutely congested and engorged with blood. It may be produced by any obstruction of the urethra. The most frequent causes are incarceration of a retroflexed gravid uterus, unilateral hematometra, fibroid and ovarian tumors deeply seated in the pelvis, and loss of muscle power in low fevers and in septic conditions.

The nurse or attendant may be led by the incontinence to overlook the occasionally enormous distention. The enlargement is gradual, extending above the navel, in the form of a tumor, which may very readily be mistaken for an ovarian cyst. The distention reaches its maximum when the reservoir can retain no more, and the abdominal pressure produces an involuntary discharge of the overflow, a condition which has been spoken of as incontinence of retention.

Even though the bedding is constantly soaked with urine, the bladder is never completely emptied. The continuous pain, involuntary discharge of urine, a suddenly formed, gradually increasing tumor, percussion dulness over its site, absence of the uterus above the symphysis, and the projection backward of the anterior vaginal wall, should make the diagnosis plain. Constant dribbling of urine should always awaken suspicion of such a condition.

Catheterization of such a patient by an ignorant midwife may cause the formation of a false passage, or negligence in the previous cleansing of the vulva will favor the entrance of infective agents into the bladder. No more favorable conditions for the extension of sepsis could be imagined.

Even if cystitis did not exist, hyperemia, infection, and traumatism, as a result of retention, would not be surprising. The enormous distention of the bladder causes anemia of its mucous membrane, thus producing disturbance of nutrition and superficial necrosis. Deep necrosis is caused by bacterial action. All such processes favor destruction of the mucous membrane. The inner wall of the bladder may become partially or completely detached, covered with phosphates of ammonium and magnesium, and penetrated with putrescent bacteria. The surface of the membrane is black or gray, contains numerous excavations, and sometimes horny concretions. The mucous membrane may come away in pieces or as a complete cast of the bladder.

A portion of the membrane or the entire structure may lodge in front of the urethral orifice and completely obstruct the evacuation of urine. A small quantity of pus only may reward the introduction of the catheter. This pus has accumulated at the lower portion of the bladder, but a more forcible pressure of the catheter may cause it to penetrate the membrane and permit the evacuation of the decomposing urine. Violent tenesmus is a frequent symptom of such conditions. The urethra, dilated, will often permit the expulsion of the entire sac as a black, putrid mass. Cases have been reported in which complete exfoliation has taken place and the patient subsequently recovered good health without disturbance of the vesical functions. Neoplasms are differentiated from cystitis by the early appearance of hematuria, with absence of pain, tenesmus, or frequent micturition.

The quantity of blood increases near the close of micturition; it may continue for days or weeks, and may cease suddenly. Sometimes fragments of the growth may be discharged. Hematuria dependent upon tumors varies with their character. If the growth is benign, its progress is slow, unless the pelvis of the kidney and ureters are involved.

Cystitis due to the presence of foreign bodies, such as calculi, is characterized by severe pain, frequent micturition, violent expulsive efforts, and hematuria, after active exercise. In arriving at a correct diagnosis it must not be overlooked that very marked disturbance of the bladder may arise from the administration of various drugs, from the application of vesicants, especially cantharides. In such cases micturition is frequent and very painful, while tenesmus is marked. The withdrawal of the irritating cause is followed by prompt relief.

The prognosis of cystitis is necessarily uncertain, and must depend upon the duration and character of the disease, extent of involvement, complications, and carefulness of treatment. When the disease has existed for a long time, the inflammation has extended through the mucous surface, more or less involving the muscular coat and causing contraction, distortion, and great thickening of the walls. It can be understood readily, therefore, that no treatment will restore the functionating power of such an organ.

The prognosis is especially unfavorable when the disease has extended to the ureter, and especially to the pelvis of the kidney unless nephrectomy is practicable. Tubercular disease of the bladder also presents an unfavorable prospect for ultimate recovery, although I have seen most gratifying results after the removal of the offending structures when the tuberculosis was secondary to disease in one kidney and ureter. The favorable results in all cases will depend largely upon the carefulness of the treatment and the degree of coöperation the physician can secure from his patient.

Treatment. In inflammation of the bladder the aim should be, first, to remove or lessen its cause; second, to afford relief to pain; third, to improve the general condition of the patient.

Prophylaxis. The first indication is met most completely by prophylaxis, which in all conditions dependent upon microbic invasion, demands immediate consideration. Disinfection of the body, of the surroundings, of the hands, and of the instruments is necessary. The old procedure of introducing the catheter by touch is reprehensible. In the puerperal woman artificial light may be necessary. The legs should be flexed strongly, the better to bring the vulva into view. A small vessel is placed between the limbs, or the patient may be placed upon a bed-pan, and a warm disinfectant fluid poured over the vulva, which may enable her to void the urine spontaneously. If unsuccessful, the vulva is sponged with a cotton tampon and an irrigation stream is directed upon the urethral orifice. Throwing a stream of hot water against the external meatus through a small nozzle (as a medicine dropper substituted for the ordinary nozzle) generally will be effective. If still unsuccessful, a catheter is taken from a disinfecting fluid and carefully introduced, to avoid pain. Occasionally there is resistance at the internal end of the urethra, which is not overcome without pain. Care should be exercised in the withdrawal of the instrument, as the mucous membrane may be sucked into the eye-let of the catheter. Pushing up the instrument before its withdrawal will loosen it, when it can be removed without vesical injury. Whenever possible, the use of the catheter should be avoided, as, notwithstanding all precautions, the mucous membrane of the urethra will be irritated by its frequent introduction, thus affording an opportunity for infection.

Medical treatment to a limited degree meets all the indications we have assigned for the treatment of cystitis. The acidity and tendency of the urine toward decomposition are çombated by the use of diuretics and by the administration of large quantities of the alkaline waters, such as Saratoga, Vichy, Seawright, Buffalo or Londonderry lithia, Carlsbad, or Seltzer. The salicylates are among the most efficacious remedies. Salol, 2 to 3 grains, can be given every three or four hours; strontium salicylate, 3 to 4 grains four times daily. Some of the formalin compounds have been found very effective, as urotropin, 5 to 10 grains, four times daily. Helmitol gr. x three or four times daily has the advantage over urotropin in that it can be given effectively in either acid or alkaline urine. These drugs should be administered largely diluted. They prevent decomposition, remove the odor, and decrease pain and tenesmus. They should not be given on an empty stomach. The diet, though nutritious, should exclude stimulants, acids, and condiments, except salt. Sugars and starches should be sparingly used, and in acute and severe cases it is well to restrict the patient to skimmed milk. In acute cases the patient should be confined to bed, and all exposure to dampness or cold should be avoided. In all cases care should be exercised regarding suitable clothing and protection against exposure. Pain may be so marked and micturition so frequent that measures must be instituted for its relief. Morphin or opium affords relief, but the pain soon returns. The remedy cannot be repeated every two or three hours without danger of establishing the habit. An ice-bag over the bladder will frequently give comfort; in other cases the hotwater bag is better borne.

In the more distressing cases opium may be given in combination with belladonna or stramonium—tincture opii deod., gtt. x–xv; tincture of belladonna, gtt. iij–v every two or three hours until relief; or suppositories of extract of opium, 1/4–1/2 of a grain, and extract of belladonna, 1/8–1/4 of a grain, in cacao-butter—two, three, or four of these suppositories daily, according to the degree of pain. Relief is most quickly secured, however, by a hypodermatic injection of 1/6 of a grain of morphin with 1/120 of a grain of atropin sulphate. When opium is badly borne, cocain hydrochlorid, 1/6 of a grain, may be given in suppositories in combination with the same quantity of extract of hyoscyamus. When the pain is limited to the urethra, it may be overcome by injecting 30 minims of a two per cent. solution of cocain with 5 minims of solution (1 : 1000) adrenalin chlorid through a syringe with a bulb nozzle. The openings about the bulb should be so situated as to direct the current back toward the external orifice. A celluloid syringe is preferable to a metal one because it can be used for sublimate and silver nitrate solutions.

Inflammation of the neck of the bladder may be alleviated by the introduction, night and morning, of a vaginal tampon covered with an ointment containing 30 grains of extract of belladonna to 1 ounce of camphorated lanolin.

Calculi and foreign bodies should be removed and shreds of membrane and casts of the bladder should be separated early and evacuated.

Gonorrheal and acute cystitis are often ameliorated by the administration of balsams, as copaibæ, cubebs, or sandalwood oil; or when the urine is acid and scanty, the diuretics, such as the alkaline salts alone or in combination with oil of birch, buchu, or triticum repens. The following prescription is often serviceable:

℞. Ammon. benzoat.,.......................... ʒiij--or
Tinct. hyoscyami,.......................... f℥j–ij
Ext. buchu *vel* tritici repens,...............ad f℥ij. M.
Sig.—A teaspoonful in an ounce of water four times daily.

Marsh directs:

℞. Acid. oxalic.,.................................. gr. xvj
Syr. aurant. cort.,............................ f℥j
Aq. pluv.,...................................ad f℥iv. M.
Sig.—A teaspoonful every four hours.

When the urine is alkaline, benzoic acid, gr. x, in capsules may be given three or four times daily, directing the patient to take large draughts of some bland water. Benzoic acid, gr. x, or camphoric acid, gr. xv, may be given three or four times daily with great relief.

The bromid salts are often of value.

Free evacuation of the bowels by salines should be secured. After the severe distress and pain have subsided in acute cases and in all chronic inflammations advantage may be secured from intravesical medication.

Indeed, even in the acute stages, irrigation of the bladder with hot salt solution frequently will relieve the distress. The bladder is irrigated through a return-current catheter by means of a fountain syringe: the fluid may be permitted to flow in until the discomfort is marked, when the tube is pinched and the fluid evacuated. (Fig. 312.) In the absence of a double catheter a single instrument may be used. The bladder is filled and the fluid is allowed to flow out, and the process is repeated until the bladder has been filled and emptied a number of times. This procedure, practised once or twice daily, gradually distends a contracted bladder and diminishes its irritability. The irrigation fluid may be hot normal salt solution; boric acid, ʒij–iv, to water, Oij; or methyl-blue (pyoktanin), gr. xv, to water, Oiss, night and morning. If the urine contains pus, employ a 2 per cent. solution of ichthyol five or six times daily; the strength may be gradually increased to five per cent. after subsidence of acute symptoms. The strength of the solution at the beginning should not exceed one-half of one per cent. S. D. Powell advocates irrigation of the bladder with a solution of carbolic acid 1 : 30, followed by irrigation with alcohol; subsequently a 2 per cent. solution of the carbolic acid is employed. Protargol 1 to 10 per cent. mercurol 2 per cent. (zinc acetate and aluminol 1 : 4), are also highly extolled. Lutaud advocates throwing into the bladder, after irrigation with a boric-acid solution, four ounces of tepid water, to which is added a teaspoonful of the following emulsion:

℞.	Iodoform.,	℥j
	Glycerin.,	ʒx
	Aq. destil.,	ʒv
	Tragacanth.,	gr. iv. M.

This preparation should be introduced and permitted to remain. In necrotic and suppurative cases cleanliness is of prime importance. The bladder should be irrigated repeatedly. The frequent ichthyol irrigation is rapidly curative. Irrigation with 3 to 5 per cent. solutions of resorcin or with silver citrate (1:8000 to 1:4000) has been advocated. I have found great improvement following the injection of one to two drams of a 10 to 20 per cent. solution of argyrol into the bladder allowing it to remain. In tuberculosis and chronic cystitis the daily injection of 15–25 minims of 5 to 20 per cent. solutions of guaiacol in sterile olive oil has been advised.

Guyon advocated instillation of gt. xxx–xl of 1:5000 sublimate solution, and as tolerance is secured, an increase from 1:5000 to 1:1500. Keisel used successfully alternate instillations of sublimate and creosote. Luys preferred emulsion of iodoform and guaiacol in vaselin oil:

℞.	Iodoform.,	gr. j
	Guaiacol.,	gr. v
	Vaselin oil.,	gr. c M.

Instillation of 5 centimeters daily, without prior irrigation, and retained as long as possible.

Pyrogallic, lactic, and carbolic acids are similarly used. Roosing especially commends the latter, having had thirteen cures by daily injections of 50 centimeters of a warm 6 per cent. solution retained 4–5 minutes. It flows back milky, and the procedure is repeated until it returns clear.

The cavity of the bladder may be explored by dilating the urethra and introducing one of the vesical tubular specula used by Kelly. With a good light the cavity can be carefully inspected and applications, such as silver nitrate, gr. x–xxx, to aq. destillat., f℥j, made directly to the affected area. In the use of these stronger applications touching the affected or ulcerated points with a solution should be followed by irrigation with a salt solution.

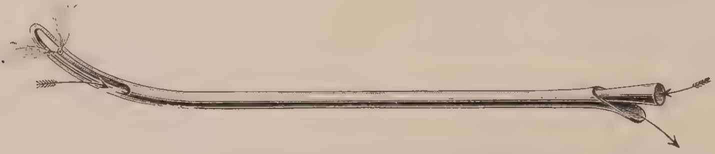


FIG. 312.—Double-current Catheter.

In subacute and chronic cystitis Clark introduces a vesical balloon of thin rubber. This balloon is connected with a thicker rubber tube, provided with a cut-off valve. Before using, it is boiled in a boric-acid solution, and its surface is coated over with a mixture of gelatin and ichthyol, 10 per cent., or bismuth and zinc, salicylic acid, or weak bichlorid. The mixture is melted and poured over the bag, which has been rolled in the shape of a suppository. With a slender pair of forceps the balloon is introduced through the speculum. It is then inflated by a bulb syringe, the number of bulb pressures required to fill it having been previously determined. The balloon remains *in situ* twenty minutes.

Guyon, in bad cases, advises that the bladder should be irrigated under anesthesia with a solution of boric acid or sublimate (1:10,000) and curetted with a medium-sized curet. The finger in the vagina as a guide enables him to go over the base and sides, while the hand over the abdomen aids in reaching the anterior surface; lastly, the urethra is scraped, the irrigation is repeated, and a self-retaining catheter is introduced and retained some fifteen or twenty days.

It is preferable that this procedure be limited to cases of ulceration and that the ulcerated surface only, be curetted. Nitrate of silver fixed on a probe, or in strong solution can be applied with advantage to the surface of the curetted ulcer. The iodid of silver has been lauded for irrigation and instillation.

Camero reports twenty-nine cases treated with curet and catheter, of which nineteen were successful. Le Clerc-Dauday follows curetting by irrigation with a solution of chlorid of iron, and later by instillation of a 1 per cent. solution of silver nitrate. In bad cases, vesical drainage is very important. It can be accomplished by the use of a catheter, a rope of gauze through the urethra, or preferably cystotomy. The latter places the bladder absolutely at rest. A sound or bougie is passed through the urethra and used to depress the anterior vaginal wall, while an incision is made through the septum. The vaginal and vesical surfaces are united by sutures to prevent the opening from closing. This procedure deprives the patient of control of the bladder contents, and requires the provision of an apparatus or receptacle for the urine.

In septic conditions, where a large portion of the vesical mucosa has become necrotic, the removal of the gangrenous mass should be followed by irrigation of the bladder with boric-acid solution (4:100) or a formalin solution (1:5000). A graduated irrigator is preferably employed, and not more than three or four ounces should be injected at one time. This may be pressed out, and the fluid again allowed to flow in, repeating this twenty times. The irrigation should be performed four times daily. It is surprising in these cases of extensive septic inflammation to note the subsequent power to retain the urine.

Ohlmacher reported a case of cystitis and pyelonephritis from colon bacillus infection which improved markedly under seven injections of the bacillus serum.

239. Ureteritis is inflammation of the ureter, and may be acute or chronic. It generally begins in the mucous membrane, extending through the wall of the canal, so that the ureter presents the palpable sensation of a thick, rigid cord.

Causes. The disease, according to Mann, is produced by a number of causes: first, injuries during parturition; second, from previous disease of the bladder; third, gonorrhea; fourth, suppuration in the pelvis of the kidney; fifth, pelvic disease, such as pelvic peritonitis, cellulitis, and tumors; sixth, abnormal conditions of the urine; seventh, tuberculosis, to which may be added an eighth—the passage of calculi.

Acute ureteritis is often mistaken for intestinal colic, pain from renal strain, catarrhal appendicitis, or acute catarrhal salpingitis. The patient has a sudden attack of abdominal pain in which the distress is limited to, or more pronounced upon, one side, or but slight upon the other. The pain is intermittent, with frequent severe paroxysms. General abdominal tenderness is probably absent, while there is noticeable tenderness upon deep palpation upon the affected side. In the beginning this is more marked near the pelvis of the kidney. The site of most marked tenderness may be situated at McBurney's point. As the inflammation subsides the pain disappears, and may be recognized at a point an inch above Poupart's ligament. Originating in the back, it cannot be differentiated in the early stage from colic occasioned by renal strain. When complicated by intestinal disorder, it may be recognized by its characteristic progress from above downward, the appearance of vesico-ureteral tenderness, and the urinary disturbance. When occurring upon the right side, its symptoms are sometimes attributed to appendicitis. The condition may terminate in recovery or may result in the chronic form.

Chronic ureteritis is characterized by frequent desire to urinate, which is more marked while erect, especially when standing, and is not wholly relieved by retaining the recumbent posture. The patient is obliged to arise from one to many times a night; the discharge may or may not be painful. Frequently, the desire to evacuate the urine will be imperative, and the urine will gush forth before she can secure privacy. Occasionally she complains of bearing down, greatly increased by standing, which disappears after a few hours' rest in bed. Palpation may afford no sign, except a slightly thickened cord, or a rigid mass almost the size of the finger, pressure along which will cause a discharge of urine with such power as to drive it some distance from the urethral orifice. The necessity for a cystoscopic examination of the bladder will depend upon the severity of the attack; when attended with much pain, it should be made. An alteration of the vesical mucous membrane in and about the orifice of the ureter will be recognized.

This alteration may vary from a slight eversion and gaping of the orifice to one in which the orifice is an oval opening upon the summit of a mound of angry-looking mucous membrane. The mucous membrane in the immediate vicinity may be normal, but is generally red and injected, even roughened and eroded.

The urea is said to be decreased upon the affected side.

The urine may be secured for examination by catheterizing the ureters or by the introduction of the Harris double catheter. (Fig. 96.)

Treatment. General treatment consists in the careful regulation of the diet, from which should be excluded strawberries, asparagus, and stimulants; tomatoes, onions, and cabbage should be used sparingly and with caution. The food should be largely albuminous, of which skimmed milk may often form its base with advantage. Large quantities of water, alkaline diuretics, or the alkaline waters are useful. In acute and subacute conditions the patient is best in bed. The nutrition should be promoted by general massage.

Local applications are advantageously made to the inflamed orifice of the ureter and to the eroded surface about it. A solution of silver nitrate (gr. x–xxx to f℥j) produces good results. It should be applied through a speculum directly to the affected surface, after which the bladder should be irrigated with a normal salt solution.

When the inflammation of the canal is extensive, the disease may be treated by irrigation through a ureteral catheter.

In tuberculous disease, which is generally secondary to disease of the kidney, the affected kidney (the other having been demonstrated to be healthy) should be extirpated, and with it the ureter.

240. **Vulvovaginitis** is an inflammation of the vulva and vagina, most frequently found in young girls, and, in the great majority of cases is believed to owe its origin to the presence of the gonococcus. Robinson ("Trans., Lond. Obst. Soc.," Jan. 4, 1898), in fifty-four cases of vulvitis in children, mostly under five years of age, was able to find cocci in the pus-cells which corresponded to the gonococci in forty-one. It may also be induced by want of cleanliness, decomposition of the natural secretions, or the entrance of pin-worms where proper cleanliness after stool is neglected. The importance of the condition is too frequently underestimated. The infection can extend to the uterus or even the pelvic peritoneum, producing changes which condemn the individual to suffering all her menstrual life and often render her sterile. The principal symptoms are pruritus, painful micturition, and a profuse yellowish, watery discharge, which constantly soils the clothing of the child and keeps the vulva irritated. The intense pruritus may readily generate the habit of masturbation.

The infection may be spread by the hands, towels, linen, and bath. In children's asylums it is not uncommon to find large numbers of girls thus affected.

The condition is frequently complicated by ophthalmia, peritonitis, and arthritis.

Treatment should be energetic. In the acute stage it consists in rest in bed, a light diet, and free evacuation of the bowels. The urine should be rendered bland, and cold applications should also be employed. Severe pain and burning can be obviated by local applications of cocain, several hot sitz-baths, and careful irrigation two or three times daily.

The patient should be isolated. As a measure of prophylaxis care should be exercised in the bathing of children in hospitals and asylums, using shower rather than tub baths.

In irrigation, cocain may be applied first. This can be followed by alkaline or antiseptic agents, potassium permanganate (1:4000 to 1:1000), silver nitrate (1:2000), protargol (0.5 to 1 per cent.), or a ten per cent. solution of argyrol. The irrigation should be made through a soft-rubber catheter introduced into the vagina. If the vagina does not drain well, the hymen should be stretched, to remove any obstruction. After irrigation, the parts should be dried and a mild ointment applied. The vulva should be covered with a sterile dressing, which should be burned upon removal. The child and her attendant should be impressed with the danger of carrying the infection to the eyes.

241. **Vaginitis, elytritis,** or **colpitis** is an inflammation of the mucous membrane of the vagina. The mucous membrane of the vagina closely resembles the structure of the skin, having few, if any, submucous glands. It consists of connective tissue surmounted by papillæ covered with several layers of squamous epithelium. A longitudinal ridge is formed upon the anterior wall, from which rugæ, or folds, like the teeth of a comb, extend upon each side. This formation is less distinct upon the posterior wall. The central projections are known as the anterior and posterior columns. The former generally terminate below in a rounded protuberance, called the vaginal tubercle, situated immediately above the meatus urinarius. Sometimes the anterior column is divided by a furrow into two portions. The rugæ aid in promoting sexual excitement, and probably contribute to vaginal enlargement during pregnancy and parturition. They disappear toward the upper part of the canal. The vagina receives its blood-supply from the vaginal, uterine, internal pudic, and vesical arteries—branches of the anterior division of the internal iliac. The vagina is surrounded by a venous network or plexus, which communicates with those of the vulva, bladder, rectum, uterus, and broad ligament, and finally empties into the internal iliac veins.

The lymphatics of the lower fourth communicate with the superficial lymphatic glands; those of the upper three-fourths, with the internal iliac glands.

The nerves are derived from the sympathetic, and form upon each side of the vagina a plexus which communicates with the inferior hypogastric.

The arrangement of the epithelium and the absence of glands render the vagina much less vulnerable to infection than either the uterus or vulva.

We have already referred to the normal secretions of the genital tract. Döderlein distinguished between the physiologic and pathologic secretions of the vagina. The former is markedly acid, dependent upon the presence of a bacillus which produces lactic acid. The latter may be feebly acid, neutral, or alkaline, and contain a variety of micro-organisms—saprophytic and pathogenic. Probably fifty per cent. of pregnant women have this pathologic secretion, in which germs flourish, and from which auto-infection is possible. The demonstration of the truth of this assertion greatly simplifies the study of the processes of infection.

The vaginal discharge becomes alkaline during the menstrual period, during the puerperium, and in many cases of leukorrhea—a condition which is more favorable for the growth of micro-organisms and the infection of the genital tract. Döderlein's assertion, however, does not correspond with the results of the researches of Menge, Krönig, and Walthard.

Krönig's investigations were confined to pregnant and puerperal women, and consequently are not a proper subject for consideration under gynecology further than to note his conclusion that the distinction between the physiologic and pathologic secretions is not determinable. He asserts that all secretions alike contain *no* pathogenic germs. All secretions are equally germicidal, though the vitality of the germ differs. It takes twice the time to kill the staphylococcus that it does to destroy the streptococcus. The vagina infected with germs will become aseptic in two or three days. The cause of this bactericidal power is as yet undetermined. It is not chemic, because it occurs whether the secretion is faintly or strongly acid; it is not believed to be due to a special bacillus, although some micro-organisms are known to be antagonistic to others. If it results from leukocytes, it must be due to a property independent of their contractile power, for the action continues after their subjection to a heat which would destroy the latter. The want of oxygen in the vagina will not explain it, for the staphylococci and streptococci are anäerobic—*i. e.*, grow independent of oxygen—and yet are killed. It is not mechanical, because particles of carbon and mercury are removed much more slowly. Possibly all these factors may unite to establish germicidal action. Krönig presents a very important practical observation, which is that a solution of corrosive sublimate for irrigation destroys the germicidal action, probably by precipitation of albumin, while plain water but lessens it. A necessary inference is that prophylactic injections of corrosive sublimate are prejudicial when the secretion is normal. Menge, in his investigations upon the nonpuerperal, introduced pyogenic micro-organisms into the vagina in eight women, and found that the vagina cleansed itself from these organisms in periods varying from two and one-half hours to three days. The factors which compass this germicidal action are various forms of bacteria and their products, an acid secretion, possibly serum action, and the absence of oxygen. This activity is weak in infants, is lessened by menstruation and by increased secretion from either the cervix or the body of the uterus, or even from the vagina. It is decreased when the vulva is patulous or the uterus prolapsed, and at the menopause.

Walthard has directed attention to the influence of change of pabulum in restoring the lost virulence of micro-organisms. He inoculated the streptococcus into the ear of a rabbit without unfavorable results, unless the ear was ligated to lessen tissue resistance, when a streptococcus from the vagina became as virulent as those found in puerperal fever. It is possible that an innocuous streptococcus may thus be restored by the tissues during the puerperium, and similarly in gynecologic operations in which there is bruising of all the tissues, as in the enucleation of fibroids.

Varieties. Vaginitis may be divided into simple and specific (gonorrheal). The latter is exceedingly important because of its intractability and its tendency to extend. The distinction between acute and chronic is merely one of degree. Special varieties named are emphysematous, exfoliative, dysenteric, phlegmonous, diphtheric, and senile, but these are unnecessary distinctions.

The etiology and pathology have undergone some consideration in our discussion of the action of micro-organisms. Of these, the gonococcus is most important, for upon its discovery will frequently depend the diagnosis. It was discovered and described by Neisser. The recognition of its presence in the secretion is diagnostic, but its absence cannot be considered a positive indication that the secretion is of other than gonorrheal origin.

Pathology. In simple vaginitis slight elevations of the mucous membrane occur, producing a granular surface. The granulations are produced by groups of papillæ, which are infiltrated with small cells; as a consequence, the papillæ swell up and push before them the stratified squamous epithelium. Superficial layers are shed. Later, the surface becomes more level, from thinning of the superficial covering. With the vaginitis of pregnancy not infrequently an emphysematous condition of the mucous membrane is associated. These elevations have been described as cysts containing a gaseous fluid. The gas consists of air and trimethylamin. Ruge says the gas is situated in the cellular tissue, Zweifel says the masses are vaginal glands whose ducts have become closed. A similar condition has been observed following the climacteric. The exfoliative, dysenteric, or diphtheric vaginitis presents localized patches or an inflammation of the whole vagina. In the latter condition the mucous membrane becomes so swollen that it is with difficulty the finger can reach the cervix, which is also thickened and covered with an exudation.

Senile Vaginitis. After the menopause the epithelial tissue is desquamated, the papillæ atrophy, and the raw surfaces cause obliteration of a large portion of the vagina. It often causes curious constrictions of the upper vagina, rendering the canal frequently cone-shaped, with the small end above, and disclosing the cervical opening as a mere dimple. Bands are often seen of contracting scar tissue which divide the vagina into loculi. Desquamation of the epithelium occurs. This probably is produced by defective nutrition, and, later, granulations develop. A loss of elastic tissue also occurs, with an increase of connective tissue, which results in cicatricial contraction. The same process can cause occlusion of the cervical canal subsequent to the menopause.

Specific Vaginitis. The most important cause of vaginal inflammation is gonorrheal infection. This produces an intractable form of vaginitis, which may continue for months, or even for years. It may extend over the mucous membrane of the uterus to the tubes, ovaries, and peritoneum, producing endometritis, salpingitis, pyosalpinx, ovaritis, and pelvic peritonitis.

Etiology. Vaginitis is produced by gonorrheal infection; irritating discharges from the uterus; the contents of perivaginal abscesses; the contact of urine or feces from fistulæ; vaginal injections, too hot or too cold, or those containing injurious chemic agents; badly fitting pessaries; decomposing tampons; efforts to produce abortion or awkward attempts at sexual intercourse; and the exanthemata; and it may complicate typhus fever, smallpox, and scarlet fever. Diphtheric patches have been observed in a number of diseases, particularly in the puerperal state. Localized patches are seen in fistulæ, in carcinoma, and about badly fitting pessaries. The disease is induced by the habits of the patient. The free use of alcohol produces the granular form of the disease. The gouty or rheumatic diathesis is a predisposing cause.

Symptoms. Vaginitis is characterized by a sensation of burning, heat, and itching in the vagina; pain in the pelvic floor, increased by exercise; frequent desire to evacuate urine, frequently with scalding. A profuse mucopurulent leukorrhea soon occurs. These symptoms are present in both the simple and specific varieties. In the latter the disease begins as an acute infection within from twenty-four to forty-eight hours after exposure, with itching of the urethral orifice, increased desire to urinate, a sensation of heat about the vulva, and burning and scalding upon passing urine. Generally, the tenderness and discharge are moderate; occasionally, throbbing is substituted. The distress is increased by walking, even by moving the limbs, and by the slightest touch of the finger. The urethral orifice is reddened and slightly swollen, and a drop of thick mucus or mucopus can be pressed out. After one or two days the entire urethra is exquisitely tender, and the orifice is swollen, intensely red, and bathed abundantly with pus. Pus and blood can be extruded from the vagina by pressure over the urethra. The hymen, vestibule, and labia become swollen, edematous, and eroded, and are covered with pus and exudate. At the end of a week the acute symptoms have subsided, the discharge is abundant, and when the parts are neglected, they become eczematous and cause a disagreeable odor. The vulva may regain its normal appearance in two weeks, while the discharge may continue for three or four weeks, or even longer. Infection of the vaginal follicles and of the vulvovaginal glands is frequent. The inguinal lymphatics become swollen, and may even suppurate. In the early part of the attack the gonococci are present to the exclusion of all other forms of bacteria, but later they may entirely disappear. The disease shows a marked tendency to invade the deeper and more important organs by the continuous mucous membrane.

Diagnosis. Upon separation of the labia a profuse discharge is noticed, covering a reddened, thickened, and roughened or granular mucous membrane. The speculum reveals the vaginal mucous membrane as a red, swollen, smooth, velvety surface, from which the rugæ have disappeared; or the redness, as well as the discharge, may be present only in patches. The cervix should be inspected, as the infection generally begins in it. The differential diagnosis between simple and specific vaginitis is often difficult. The history of a distinct infection would be valuable, but it is often too delicate a subject for interrogation. It may be suspected from the sudden onset of the attack, associated with urinary symptoms, a protracted course, and obstinate resistance to treatment. The inflamed urethra and ducts of the vestibule and the orifice of Bartholin's ducts, and not infrequently, the formation of cysts or abscesses in the ducts or glands, with swelling of inguinal glands, afford additional confirmation. Recognition of the gonococcus by culture and microscopic investigation renders diagnosis certain. Absence of the gonococcus is not proof positive of nongonorrheal origin, for the gonococcus may disappear from the secretion.

Even when the specific origin can be determined beyond peradventure, caution should be exercised in the expression of an opinion, as it may cause serious social unhappiness. The diagnosis of simple vaginitis will not be sufficient, but the physician should examine the various structures carefully to determine, if possible, the exact cause. Pelvic abscesses discharging into the vagina have been mistaken for vaginitis.

Prognosis. The ease and rapidity with which vaginitis can be cured will depend upon the cause. The milder cases may be confined to the external genitalia, or may disappear even after the Fallopian tubes have become affected. In the more severe forms the entire genital tract may be involved rapidly, and portions of the tract may retain the disease and reinfect other portions. The general health is impaired in the chronic cases. The ovum, when it can enter, may find the uterus unfitted for its retention and, therefore, an abortion may result. Preëxisting gonorrhea is said not to disturb the first two weeks of the puerperium, but subsequently there is a marked tendency for the germs to develop renewed virulence and to invade the healthy structure.

Treatment. When the disease is in its acute stage, the patient should be kept absolutely quiet in bed. Sexual activity should be suspended, as well for the interests of the patient as for the prevention of further propagation of the disease. The diet should be confined to nonstimulating articles. Alcoholic stimulants, pepper, and various other condiments should be prohibited. Saline laxatives are advisable, and the patient should be encouraged to drink largely of emollient liquids or alkaline waters.

Local applications should consist of hot sitz-baths, alkaline douches. A saturated solution of boric acid in hot water may be given for fifteen to twenty minutes out of every two or three hours during the day, and every four while the patient is recumbent at night. The ordinary fountain syringe serves well, or a piece of rubber tubing weighted at one end and provided with a clip and nozzle at the other. The weighted end, with the coiled tube, is placed in a basin of water above the level of the bed, the clamp applied, and the end of the tube withdrawn and introduced into the vagina. The clip opened, the water is siphoned out as long as the external end is kept below the level of the basin. When the acute symptoms have subsided, douches should be given every three hours for the first two weeks. These douches may consist of solutions of sublimate 1:4000, potassium permanganate 1:4000, carbolic acid, lysol, or creolin, protargol 0.5 to 1 per cent., mercurol 2 per cent., sodium chlorid 2 per cent., or sodium bicarbonate 2 per cent. After the period mentioned the strength of the fluid may be doubled and the frequency of the applications is lessened, now employing them four times daily. The dry treatment consists in cleansing the surface with a douche or by washing the vagina through a speculum; dry and pack with borated or iodoform cotton or gauze and repeat every eight hours until the secretion is checked, after which it is given twice daily. A dry absorbent dressing must be applied to the vagina every two hours.

Astringent douches are substituted in chronic cases and after the subsidence of the acute stage. Cleanse and dry the vaginal walls and paint with silver nitrate solution (ʒj:f℥j), followed by a tampon saturated with a solution of bismuth in glycerin, which keeps the walls separated. Fritsch recommends zinc chlorid (gr. ij:f℥j). A one per cent. solution of lead acetate, zinc sulphate or alum, potassium permanganate (1:2000), or painting the surface with undiluted tincture of iodin, are serviceable. Acceptable powders are equal parts of tannin and iodoform, bismuth subnitrate and chalk, or boric acid and acetanilid parts retained with a tampon. In senile vaginitis cleanse with a saturated boric-acid solution. Tampons may be saturated with a 0.5 per cent. solution of lead acetate, or strips of lint may be saturated in a five per cent. solution of carbolic acid in glycerin or smeared with zinc ointment. Vaginal suppositories of tannin and iodoform, each five per cent.; zinc oxid, ten per cent.; or lead acetate, two per cent.; may be used. When the condition is chronic, spray through a speculum with a two per cent. solution of silver nitrate. The spray drives the medicine into the crypts and folds, and is far more effective than swabbing. I have derived more benefit from tampons anointed with ichthyol in lanolin (1:4); it causes a desquamation of the entire epithelium of the vagina and is destructive to the gonococcus.

CERVIX AND BODY OF UTERUS.

242. Inflammation of the Cervix and Body of the Uterus.—The classification of uterine inflammation has been and still is a difficult and perplexing problem.

Various views have been presented. The existence of inflammation of the endometrium, except in acute conditions, has been denied. The so-called chronic inflammation is denominated catarrh and uterine congestion, and frequently is attributed to peri-uterine inflammation. This statement would seem a distinction without a difference, and results from failure to appreciate the varying character of inflammatory changes in different tissues. The continuous mucous membrane is exceedingly vulnerable to the possibilities of infection. The irritation thus produced results in the production of inflammation. Its violence and extent will depend upon the virulence of the poison and upon the resistance of the patient. It may vary from a slight inflammation which involves the cervix only to one which extends to the entire uterine cavity with infiltration of the submucous structures; or it may become interstitial or parenchymatous. Frequently in virulent attacks it passes through the wall to its surface and causes perimetritis. In our early classification we spoke of metritis, in a sense of inflammation of the entire organ; when it predominates in the lining membrane, it is called endometritis. When involvement of the deeper structures occurs, it is known as parenchymatous or interstitial metritis, and as perimetritis if the peritoneum becomes involved. The latter condition is generally described as pelvic peritonitis, because, although inflammation can reach the peritoneum as described, it more frequently does so by the progress of the inflammation through the tubes, and its extension to other structures than those immediately enveloping the uterus.

The anatomical arrangement of the cervical mucous membrane makes evident why inflammation can be confined to the cervix, although in puerperal women it is very prone to extend to the body.

The various classifications are based upon clinical phenomena, pathologic changes, and causal relations. The ideal classification is that of Döderlein, in two divisions: first, inflammation produced through the influence of micro-organisms; second, inflammation independent of their influence. The former is subdivided into: (*a*) septic and saprophytic; (*b*) gonorrheal; (*c*) tubercular; (*d*) syphilitic; (*e*) diphtheric. The brevity of our knowledge of the influence of micro-organisms makes a careful differentiation difficult, but we are scarcely in a position to assert that there is any inflammation that is absolutely independent of bacterial production. My experience as a teacher has led me to discard the classification based upon the clinical phenomena, because it is difficult to associate therewith the pathologic relations. For this reason I propose to present the simpler and more frequently employed classification into acute and chronic, the latter subdivided into cervical catarrh, or endocervicitis, endometritis, and metritis. Acute endometritis affects both body and cervix. The chronic inflammation can be localized in the cervical mucous membrane. The classification of uterine diseases is still further complicated by the physiologic changes which occur in the uterus as a result of menstruation. Thus, the uterine mucosa undergoes a periodic hypertrophy and degeneration, and it is often difficult to differentiate between the physiologic condition and early pathologic processes.

243. Endocervicitis—Chronic Cervical Catarrh. Cervical endometritis is an inflammatory process which affects not only the cervical canal, but the entire cervix. The symptoms and appearance of the disease differ greatly in the unmarried or nulliparous and the multiparous woman, and it manifests itself as inflammation of the portio vaginalis or of the cervical canal. In the former, the connective tissue of the vaginal portion of the cervix shows decided small-cell infiltration; the blood-vessels, especially the capillaries, become dilated and turgid with blood. Sometimes they become so distended as to form varicosities resembling hemorrhoids. Immediately beneath the epithelium the connective tissue is found rich in cells, which later become converted into granular tissue. The squamous epithelium of the surface is in many places infiltrated with leukocytes, and it undergoes hypertrophic changes from the increased blood-supply. Numerous papillæ are formed and become covered with a single layer of epithelium which permits the red color to show through and the surface to present the appearance of an erosion. (Fig. 313.) Such a condition is generally recognized as simple erosion, and it generally involves the squamous epithelium of the vaginal portion of the cervix. When the external os has been lacerated, the lips often will be widely separated and gaping. The mucous membrane is everted and presents irregular granular patches which protrude beyond the os. Such a condition was formerly regarded as ulceration. The microscopic examination of such a surface reveals the apparently denuded portion covered with epithelium. The increased blood-supply and the infiltration of the tissue with lymphoid cells cause the cervical lining to become everted and project from the os like a fungus. Such a reddened, everted surface is sometimes known as granular or papillary erosion. At first the glandular structure is not involved, but eventually hyperplasia of the glandular epithelium results and there is an increase in the number and size of the glands. (Fig. 314.) The latter condition is more limited to the superficial structure, which seems to be taken up with glandular tissue, to the almost complete exclusion of the connective. In the former, the glands enlarge and project through the structure of the cervix, sometimes even lifting up the squamous layer. The accompanying hyperplasia of the connective tissue may cause more or less constriction of the gland-ducts, and in certain places they may be closed completely, thus resulting in the distention of the glands and the formation of cysts. These cysts are known as retention cysts or ovules of Naboth. (Figs. 314 and 315.) They form nodular projections around the external os or can project deeply into the cervical tissue, becoming prominent upon the vaginal surface at quite a distance from the external os. As the vaginal portion in the normal condition possesses no glands, it is evident these have been either extruded from the os with the hypertrophied mucous membrane, or have pushed through the structure of the cervix in the manner already described, and may lead to an extensive cystic degeneration of its structure. In one patient recently under observation change in the structure of the cervix was so marked as to lead to the diagnosis of sarcoma by myself and others, but the subsequent investigation disclosed that the condition was benign, though the cervix was entirely taken up with the cystic change. Infection may result in the formation of abscesses, or

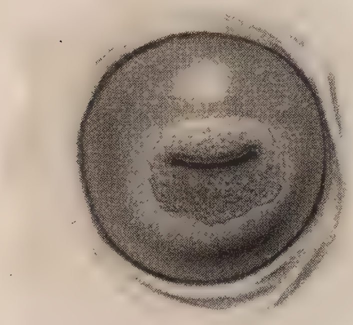


FIG. 313.—Simple Papillary Erosion of the Cervix.

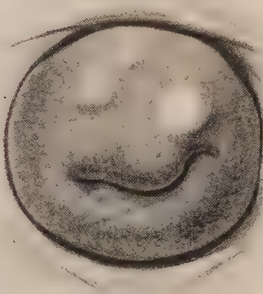


FIG. 314.—Simple Papillary Erosion with Enlarged Follicles.

the gradual distention may lead to a rupture of the cyst, producing what is known as follicular erosion, in which the entire cervix or the greater portion of it may be involved. The increased glandular secretion, mixed with the transudation from the eroded surface, produces a very profuse leukorrheal discharge. The protruding structure often is so extensive as to render its origin uncertain, but evidently it is produced by proliferation of the epithelial lining of the cervical glands. Chronic inflammation of the connective tissue occasionally causes such hyperplasia as to increase the size of the cervix greatly. In the nulliparous the cervix forms either a rounded mass, which increases its size in all directions, or may become so elongated as to produce a condition resembling prolapsus, known as pseudoprolapsus. In previous laceration of the cervix only one lip may have undergone this hyperplasia. Both lips may be involved when they will be widely everted and turned outward and backward, reminding one of the top of a celery stalk. The glands over such a surface are likely to become obstructed and produce retention cysts, which are recognized as firm, pea-like masses beneath the finger. Occasionally such cysts form abscesses or rupture, and with the proliferating epithe-

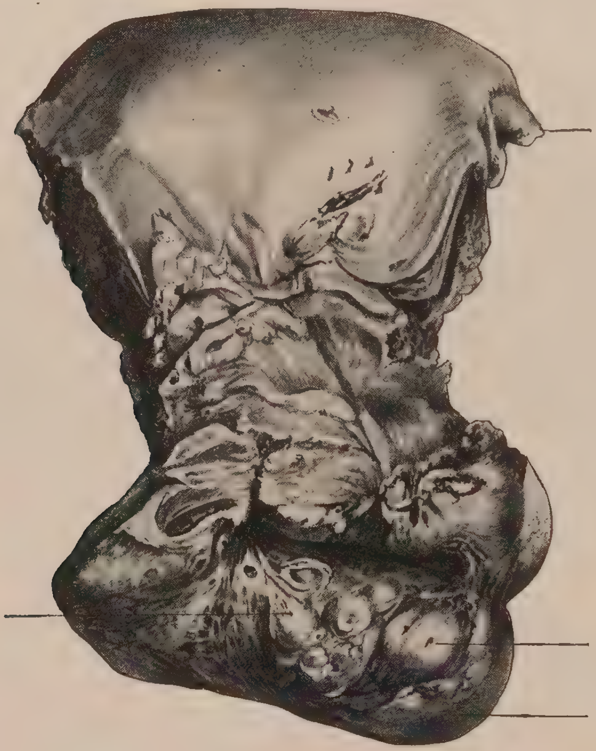


FIG. 315.—Extensive Cystic Disease of the Cervix.
a, *a*. Glands dilated with secretion. *b*. Large nodule formed by union of many glands and distended with fluid,

lium present an extensive raw surface which can be mistaken for carcinoma. A number of cysts in close approximation may become united through the absorption and breaking-down of the intervening septa and thus form one large cyst. Puncture of the cyst permits the escape of a large quantity of viscid fluid rich in corpuscles, with subsequent contraction and obliteration of the cavity.

From the discussion it can be readily inferred that the inflammation involves all the structures of the cervix, the epithelium, the glands, and the connective tissue, and thus varies in its form and manifestations according to the predominance of the structure involved. When the glands are extensively involved, the cervix presents what is known as cystic degeneration. The increase of connective tissue results in what Thomas has so aptly described as areolar hyperplasia or cervical sclerosis.

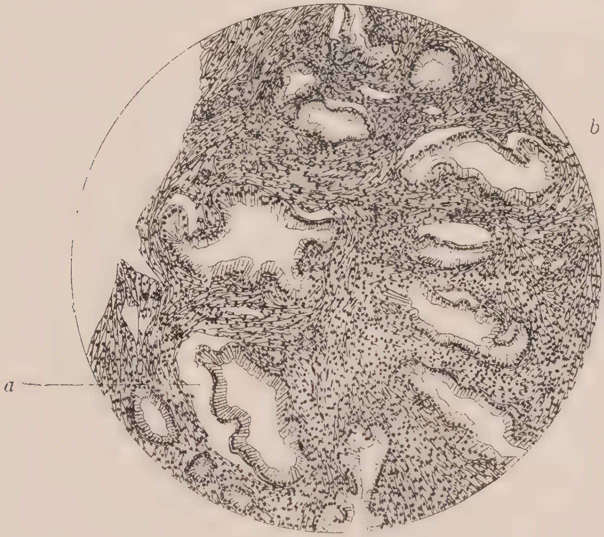


FIG. 316.—Chronic Endocervicitis.
a. Dilated gland forming cyst of Naboth. *b.* Detachment of glandular epithelium after absorption of fluid.

Causes. Inflammation of the cervix arises from extension of inflammation from the body of the uterus, the vagina, and the vulva, as a result of excessive coition, laceration, injuries during instrumental and digital examination and manipulation, and from puerperal and gonorrheal infection. The cylindrical lining of the cervix is particularly vulnerable to infection, especially after laceration, when exposed to friction against the walls of the vagina, and to injury during the act of coition or examination. It is rare to have inflammation of the body of the uterus without involvement of the cervix. The latter is prone to occur because the uterine discharges flow over the cervical mucous membrane and irritate it. Endocervicitis is particularly likely to be produced by congestion of the uterus in association with flexions, especially retroflexion. In retrodisplacements and in anteflexion separation of the lacerated surfaces is favored, and the delicate cervical mucous membrane is exposed to a greater degree.

Symptoms. The principal symptoms of cervical inflammation are leukorrhea, pain in the back and loins, aggravated by exercise or standing, irregular menstruation, and sterility. Leukorrhea is the most important symptom. The normal secretion from these parts is insufficient to attract attention. When it is excessive, it becomes known as leukorrhea, or, in popular language, the whites. A temporary discharge—a transparent leukorrhea, like white of egg—due to temporary congestion frequently occurs preceding and following the menstruation. The secretion from the cervical glands is clear and viscid, resembling white of egg. It becomes white when mixed with mucus-corpuscles, and yellowish when pus-corpuscles are present. Not infrequently it is tinged with blood, which escapes from the delicate vessels of the newly formed vascular tissue. Pain is aggravated by walking, standing, riding, or anything which increases the friction between the cervix and the vaginal walls. Menstruation is irregular and there is generally an increase in the quantity of the flow, probably produced by an extension of the inflammation to the endometrium. Sterility is often present. In the nulliparous woman suffering from endometritis the cervical canal is filled by a plug of mucus, which may afford a bar to conception. In the multiparous woman the presence of cervical inflammation may render the woman less susceptible to pregnancy, but it is not, however, considered an absolute obstacle to conception.

Physical Signs. The appearance and outline of the cervix differ in the nulliparous and multiparous woman. In the former it is puffy and large, the os being soft and velvety. The patient will complain of pain when the cervix is moved or pressed. In the multipara the cervix is generally lacerated; its margins are soft, velvety, and eroded, or hard, presenting pea-like nodules, polypoid projections, cystic masses; or the os may be gaping, so as to permit the introduction of the finger nearly to the internal os. The one lip may have undergone involution, while the other is enlarged and elongated. The mucous membrane is irregular, not infrequently presenting longitudinal ridges. Digital examination affords an idea as to the position and relation of the cervix, and as to its condition, whether lacerated or otherwise. The digital examination should be supplemented by the use of the speculum, the latter being used to confirm suspicions which have been engendered by the digital examination. The Sims speculum is preferable, as it affords less displacement to the parts and permits more thorough and complete inspection. In the nullipara the os will be filled with a plug of tenacious mucus surrounded by a patch of excoriated tissue, particularly upon the posterior lip, from which the outer layers of the epithelium have been desquamated. In the multipara probably a laceration will be seen. Its presence is often overlooked, because the fissures are filled up with indurated cicatricial tissue. The use of tenacula to turn in the surfaces demonstrates its existence. The bluish-red ovula Nabothi may be readily seen as nodular projections upon the surface.

Diagnosis. Cervical catarrh is readily determined from vaginal inflammation by the use of the speculum. In the former a plug of mucus will fill up the cervical canal and project from it, being so viscid and tenacious that its removal is accomplished only with difficulty. To remove the mucus thoroughly from the surface it may be necessary to use a curet or better, suction by a syringe. The mucus in the interior of the dilated glands should be removed by puncture and digital pressure. When the cervical discharge is insufficient to render it visible, Schultze's method may be employed. He gives the patient a vaginal douche, introduces a speculum, thoroughly cleanses the surface, and places a tampon soaked with a solution of tannin against the external os. This applied at night and removed through a speculum the following morning, the character and quantity of the discharge from the cervix can be noted.

The differentiation between endocervicitis and endometritis is still more difficult. In many cases, indeed, we may not be able to say definitely that a cervical catarrh is not associated with more or less inflammation of the endometrium. The enlargement and thickening of the cervix demonstrate that it is the seat of inflammation. It is sometimes difficult to differentiate between inflammation and malignant disease of the cervix. In the former the hypertrophy is more general and uniform, the tissues are more or less firm, but not hard, and show no inclination to friability. In malignant disease the cervix at points may be hard and indurated from the presence of an infiltrate which is more or less localized. An excavated ulcer may be present, covered with friable, easily broken-down tissue, which will crumble and become detached under the finger, while the base is hard and resisting. Hemorrhage and a profuse, foul-smelling discharge are prominent symptoms. When the condition is such as to leave one in doubt, a test excision should be made and the excised tissue subjected to microscopic investigation.

Prognosis. The curability of endocervicitis is dependent upon the general health of the patient, the duration of the disease, and the extent of involvement. Not infrequently it will be found that these patients have passed through the hands of a number of physicians, and, therefore, extreme care must be exercised as to the prognosis. The result is less favorable when there is a large amount of secretion and apparently but little glandular degeneration.

Treatment is first, constitutional: The patient should be encouraged to take outdoor exercise. Frequently change of air will prove of decided value. Quinin, iron, strychnin, arsenic, and the bitter tonics, will be of advantage. Indigestion should be corrected, regular action of the bowels secured, and sexual rest advised.

Second, local treatment: In the nullipara it is advisable to give hot vaginal douches through a fountain syringe under moderate pressure for ten to fifteen minutes each night, having the patient preferably in the recumbent position. Doubtless in some cases the hot water thrown with force from a bulb syringe against the cervix will have a more marked modifying influence upon the hyperplastic process and, therefore, it should supplant the fountain syringe. The temperature of the water should be from 110° to 115° F., and the patient should be advised to remain in bed following the douche. Astringents can be added, such as a solution of zinc sulphate (ʒj–ij–water Oij), powdered alum (ʒj–Oij), lead acetate (ʒj–ij–Oij), or the latter and zinc sulphate may be combined. Mild solutions of antiseptics may be substituted for the astringent, as hydrargyri bichlorid (1:4000), formalin (1:2000), but these agents present no special advantage over the douche of sodium chlorid, ℥j, water Oij. The os, when narrow and contracted so that drainage is ineffective, should be notched bilaterally with scissors, to permit the escape of the mucus. The lips should be trimmed, making a funnel-shaped opening. (Figs. 317 and 318.) When the secretion continues, local applications, such as tincture of iodin or carbolic acid, a saturated solution of iodin crystals in carbolic acid, 95 per cent., can be employed; the former in mild, the latter in more severe, cases. Heywood Smith advises acid nitrate of mercury; De Sinety, chromium trioxid. Better results are secured from the employment of the milder agents, as zinc sulphate or chlorid gr. x, aqua f℥j, silver nitrate gr. x–xv–℥j, or solution of argyrol (20–40 per cent.). In making an application, the mucus should be removed first from the canal with a cotton-wrapped applicator, a pledget of gauze in dressing forceps, by suction with a long nozzled syringe, or a blunt curet. When the mucus is very tenacious, its removal is greatly facilitated by throwing in a few drops of hydrogen dioxid by means of a pipet, after which it is more readily wiped away. This step is important to prevent the application from being coagulated by the mucus without reaching the

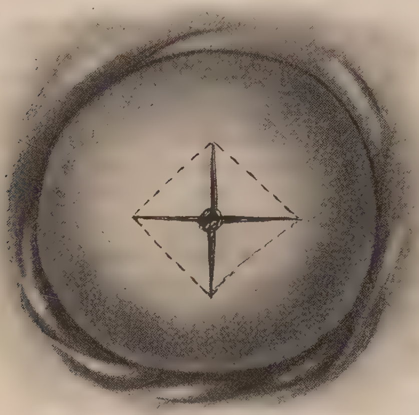


FIG. 317.—Lines of Incision for Contracted or Pinhole Os.

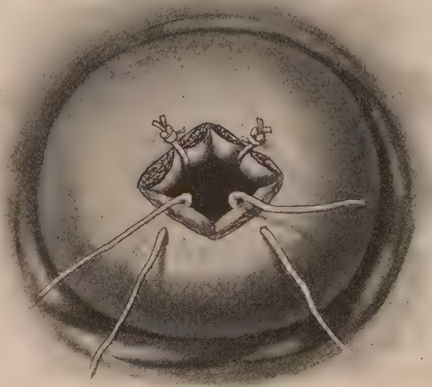


FIG. 318.—Union of Vaginal and Cervical Mucous Membranes.

affected surface. After the application any surplus fluid should be removed, and a tampon of cotton or of gauze saturated with glycerin should be placed beneath the cervix. A 25 per cent. solution of ichthyol in glycerin, or ichthyol in lanolin, of the same strength, may be applied to the cervical canal with a cotton-wrapped probe, or a small pledget of gauze or cotton anointed with it may be carried into the dilated cervix, or a tampon medicated with it may be applied to the eroded cervix. Ichthyol is advisable because of its germicidal action. The application of such a tampon will not infrequently result in the desquamation of an epithelial cast, followed by a regeneration of the epithelium and restoration of a healthy appearance of the cervix. The application of a saturated solution of iodoform in ether is advised. Ether stimulates contraction of the glands and forces out the secretion, while the iodoform remaining acts as an antiseptic. In the multipara, endocervicitis is not infrequently complicated by retroflexion, subinvolution, or laceration of the cervix. The first consideration should be to relieve congestion by scarification of the surface, puncture of retention cysts, hot astringent or antiseptic douches, and the use of medicated tampons. Some form of glycerin medication upon the tampon is especially efficacious in causing profuse depletion. The displacement should be corrected and the organ should be maintained in a proper position by a tampon or pessary. When the cervical mucous membrane is much everted and the lips are widely separated by laceration of the cervix, the relief of the engorgement and congestion can be overcome by Emmet's operation. The uterine congestion may be greatly decreased by local depletion through scarifying or puncturing the cervix. Such depletion is of special value where a number of glands of Naboth have become obstructed and have formed retention cysts. Evacuation of the cysts and the introduction of tincture of iodin or carbolic acid into their cavities cause a sufficient amount of inflammation to obliterate them and relieve the pressure. In obstinately chronic cases destruction or removal of the diseased glandular tissue is imperative. It may be accomplished by the use of the Paquelin thermocautery or by various caustics. Skoldberg recommends zinc-alum sticks, which are made by running together into molds equal parts of zinc sulphate and alum, forming a small stick, which is carried into the cervix and retained by a plug of gauze in the vagina, which also receives the discharge. Silver nitrate in solid stick was formerly much used for this purpose. The latter method of treatment is required only in exceedingly severe cases, and its application should be extremely limited. It cures by destruction of the mucous membrane and glandular structure, substituting for them cicatricial tissue. It should not be used where there is danger of the cervical canal becoming so contracted as to interfere with drainage from the uterine cavity. Colpe, finding that an inflammation of the cervix did not yield to the use of astringents and caustics, examined the secretion and found present mycotic spores, after which he used lactic and salicylic acids, with immediate relief.

Electricity has its advocates. The negative pole is introduced into the cervix, while the positive pole is placed upon the abdomen. It is questionable, however, whether this plan of treatment has any advantage over other caustic measures. The use of the sharp curet not only removes the glands from the cervical canal, but, as advocated by Thomas, scrapes away the arbor vitæ from the internal to the external os. This measure not infrequently has to be repeated a second or even a third time before relief is complete. When there is very marked eversion or an eroded, deeply fissured surface, Schröder's operation should be performed. This consists in the formation of a single flap in each lip. The method of procedure has been described. (Section 208.) Franklin Martin removes a larger amount of the cervix, and combines amputation with excision. He splits the cervix into two lips, cuts through the cervical mucous membrane on the posterior lip above the diseased portion, then removes as much of the lip as is necessary, and stitches it. The anterior lip is treated in the same way.

244. **Acute Metritis and Endometritis.** In acute inflammation the pathologic changes are not confined to the endometrium, but rapidly involve the entire organ. In the nonpuerperal uterus they are excited by infection from gonorrhea; follow trauma, induced by exploratory operative procedures; or result from exacerbations of the chronic state. The nonpuerperal cases are rare and scarcely ever fatal or sufficiently threatening to require hysterectomy. Such an inflammation is generally brought on by an infection which has occurred during parturition or abortion, and, consequently, is more an obstetric than a gynecologic condition.

Infection is favored by:

1. Protracted labor during which the tissues have been subjected to bruising or laceration.
2. Want of skill or cleanliness in the practice of manual or instrumental procedures.
3. Retention of clots, portions of placenta, or decidua after labor or abortion.
4. Presence of septic germs in the genital canal prior to the occurrence of gestation, their introduction during the process of delivery or in the subsequent convalescence.

Pathologic Alterations. The infection is implanted originally in the degenerated mucosa, in thrombi of the uterine sinuses, the site of the placenta, in retained portions of placenta or decidua, or in lacerations of the vagina or vulva. Intense hyperemia produces alterations in all the tissue elements. The gland lumina are dilated by increased secretion and proliferation of glandular epithelium. Round-cell infiltration occurs in the affected tissues with subsequent degeneration and destruction of their cellular elements. The mucosa becomes greatly swollen and edematous. Its epithelium is found granular and desquamating. The uterine blood-vessels and sinuses become engorged and thrombosed. Inflammatory exudate is poured into the cellular tissue which may result in abscess formation, either in the walls, sinuses, or both.

Such pus pockets, at first small and localized, increase in size, the intervening walls break down, and an abscess of considerable size may form, rupture into the uterine cavity, and thus terminate favorably. More frequently, a large portion of the uterus becomes gangrenous, causing a serious detriment to health—even loss of life. The autopsy on one of my patients who died in the Philadelphia General Hospital revealed the entire uterine fundus as completely destroyed.

The infective processes are not confined to the uterus, but the infection travels by blood-vessels or the lymphatics to the parametrial tissue where the effort to limit its progress results in the formation of inflammatory exudate. This often fills the pelvis, encircles the uterus, and practically imbeds it. If the infection is virulent or the resistance of the patient greatly diminished, extensive pus collections occur. The walls of the blood-vessels become inflamed and phlebitis of the veins is a result. Fragments of infective material float in the blood to lodge in distant parts to form secondary collections and thus produce infarcts or abscesses according to its virulence. This condition, known as pyemia, is the product of the same micro-organisms that produce septicemia. The joints (particularly the knee and elbow), the lungs, liver, kidneys, heart, spleen, brain, and the skin may be the seat of these pyemic processes.

Varieties and their Source. The manifestations of infection will depend on its character and are properly divided into the sapremic, septicemic, and the pyemic.

Sapremic infection is the product of the action of saprophytes on retained blood clots and portions of the decidua or placenta, which result in their decomposition and the subsequent absorption of the toxins thus produced. While decomposed material undisturbed presents a favorable soil for the implantation of septic infection, septicemia occurs more frequently as a primary disorder induced by the entrance of the pathogenic germs through fractures of the mucous membrane of the uterine body, cervix, vagina, or vulva. It has already been indicated that inert pathogenic micro-organisms inhabiting the vagina can be stimulated into activity by changed conditions, but are more frequently introduced from without, through failure of the physician or nurse to observe proper antiseptic or aseptic precautions.

Pyemia is the result of the circulation in the blood of particles or fragments of infected material which can be carried to parts remote from its original location and result in the formation of additional and recurring foci of infection. It is dependent for its production on the same germs which result in the development of septicemia.

Symptoms. Sapremia suddenly manifests itself, three to ten days subsequent to delivery, by elevated temperature and repeated rigors. Chills may occur daily, with a temperature varying from 102° to 105° F. though generally increased, and abdominal pain and tenderness are not marked. The lochial discharge may be absent, or exceedingly foul. Manipulation over the uterus may be followed by contraction and the expulsion of a large offensive mass, after which the patient will improve, or she may have profuse bleeding. Digital examination discloses the presence of retained masses and affords evidence of their decomposition. Septicemia is more insidious in its onset, but the symptoms appear earlier.

The reaction induced by septicemia will depend upon the condition of the patient, the length of time after delivery prior to infection, and the virulence of the infective poison. Its course naturally depends on the particular structures involved. As early as the second or third day, not infrequently upon the first, the patient will exhibit an elevation of temperature, which gradually increases. She suffers from pain or tenderness in the lower abdomen, which may be so marked as to confine her to the dorsal decubitus, with her limbs flexed and unable to exercise the slightest muscular action, because of pain. Not infrequently the bladder becomes greatly distended; the pulse is rapid, varying from 110 to 140; respirations frequent, and the temperature displays a range from 101° to 107° F. The lochial discharge is arrested or free, and may be mucous, mucopurulent, ichorous, or sanguinolent. It may have a stale, sickening smell or be almost free from odor. The cervix and vagina, upon inspection, may appear normal or highly inflamed, swollen, and covered with glairy mucus, or exhibit patches of diphtheric exudate. The entire uterine structure is likely to be smooth, swollen, and exceedingly tender to pressure. The cervix will appear lacerated and boggy. When the inflammation is confined to the uterus, the organ will be tender and enlarged, edematous and flabby, but not so sensitive as to preclude palpation. If the peritoneum is involved, pain and tenderness will be very acute; the limbs are drawn up to protect the abdomen from pressure of the clothing and to relieve the traction upon the abdominal wall. The progress of the disease will depend upon the virulence of the poison and the resistance of the patient. In the sapremic condition the source of origin of the disease may be expelled and the patient rapidly progress toward recovery. A patient suffering from septicemia may be so fortunate as to secure immunity against its further progress and slowly recover. The disease may become localized and a pus-collection be spontaneously or artificially evacuated, or the general system may become so infected that, notwithstanding every therapeutic procedure, the patient succumbs. An unfavorable prognosis is indicated by a persistent high temperature, a pulse-rate continuously above 130, and the absence of localized foci. If the serious symptoms subside and the general condition of the patient improves, but the pulse-rate continues rapid, with an evening temperature of 100° F. or over, the patient should be regarded as still in danger. Septicemia was formerly known as puerperal fever and was supposed to be due to some obscure poison characteristic of that condition. The investigations of Semmelweiss and others demonstrated that it was analogous to surgical fever and due to a similar cause. The disorder is hydra-headed in its manifestations, and makes its invasion by one of three routes: through the continuous mucous membrane of the body of the uterus and Fallopian tubes to the peritoneum; through the blood-vessels or the lymphatics. Thus we may have inflammation of the structure of the uterus, the Fallopian tubes, the ovaries, the pelvic cellular tissue, or the pelvic peritoneum, or even all combined. Any of the veins of the body may become involved in the septic phlebitis, but the condition occurs most frequently in those of the lower extremities, causing the condition formerly known as milk-leg, which we now recognize to be an infective phlebitis. It may manifest itself also by a severe lymphangitis. The disease may rapidly involve the general system, giving rise to profound symptoms of septicemia without any special localization. A stinking lochia has been regarded as affording a favorable prognosis. Septicemia may terminate fatally in twenty-four hours or the patient may continue in a serious condition for weeks and finally recover.

Pyemia is slower in its manifestations. It may develop suddenly with a severe chill when the patient has manifested no alarming symptoms until the fifth to the eighth day. Without an indication of peritonitis or parametritis the temperature becomes high, the pulse-rate rapid, and the patient has recurring chills. These may occur at intervals of a day or not for several weeks. Death may occur in ten to fourteen days, or this disorder may continue for months. Abscesses may occur in the larger joints, the internal organs, and in the skin.

Diagnosis. The early differentiation of sapremia and septicemia is very important. The former, being associated with retained decomposing products, manifests itself several days after delivery. Symptoms develop suddenly in a patient who seemed to be undergoing a normal convalescence. The lochial discharge, where present, is exceedingly offensive. A digital examination discloses a clot, a portion of placenta, or a portion of decomposing membrane within the uterine cavity. These products, when removed, have a very offensive odor, and with their disappearance the symptoms rapidly subside. In septicemia the symptoms occur more insidiously and at an earlier date following delivery, unless, however, the infection should have been implanted late. Elevation of temperature following a delivery should be regarded as a danger-signal, and induce the attendant to review the patient's history, and instigate a judicious interrogation of the physical signs. The condition of the breasts should not be overlooked for frequently women have a high temperature concomitant with the establishment of lactation. The breasts become greatly distended, caked, and hard. The temperature of the patient may reach 105° F. or over. Occasionally the nipples may be the source of infection and lead to mammary abscess.

Typhoid fever and malaria are frequently mistaken for sepsis and *vice versa.* The possibility of these conditions should be excluded by a careful examination of the blood. Finding in malaria the plasmodium, in typhoid fever a positive Widal reaction, and the examination of the urine establish the diagnosis. Furthermore, the typhoid bacillus may be found in the urine and occasionally in the blood. A digital examination excludes sapremia when it reveals the walls of the uterine cavity to be smooth and free from any decomposing products. Intoxication from morbid products in the intestinal tract sometimes may simulate septicemia closely. It was my privilege to see with two physicians a young woman who was suffering from a very high temperature with some abdominal distension. There were no signs of any localization of sepsis. The patient had been delivered a week previously. Examination disclosed the uterine cavity to be free from any decomposing material. There was absence of tenderness over the uterus. The woman had some fifteen foul-smelling stools during the preceding twenty-four hours. It was her first confinement, and there was a history of her having undergone a curetment some three years before. She had been very carefully managed during her confinement, with every aseptic precaution, and had been cared for by a well-trained nurse. The inference of the attendants was that she had some local accumulation in a tube prior to her delivery, from which this infection had developed. But as I found the uterus free from any tenderness or undue enlargement, no sign of infection in the vagina, no tenderness nor swelling about either tube or ovary, I reasoned, therefore, that if a local condition had existed, it should still show evidence of its presence. In view of the very evident intestinal disturbance, I ascribed the symptoms to an intestinal infection, and suggested measures for its correction. The rapid subsidence of the symptoms and recovery of the patient confirmed the diagnosis.

Having reached a diagnosis in septicemia, by exclusion, it is desirable to recognize and treat the local manifestations promptly. These are determined by the size and evidence of laceration of the cervix, the existence of patches of diphtheric exudation in the vagina or uterus, and the possible form and progress of the infection. Metritis will be indicated by a large, swollen, more or less tender and boggy uterus; perimetritis or pelvic peritonitis by extreme tenderness in the lower portion of the abdomen, pain and anxiety of the patient, a frequent, rapid, wiry pulse, and high, sometimes low, and even subnormal, temperature; the latter symptoms, moreover, rather increasing the danger. Phlebitis will be recognized by tenderness over the femoral and saphenous veins, as these are the ones in which the disease most frequently manifests itself. Lymphangitis is often indicated by the existence of inflammation of the cellular tissue and by pain and tenderness over the lumbar or inguinal regions.

Pyemia is recognized by the occurrence of chill, or recurring chills, associated with a low grade of fever, frequent sweating—especially when accompanied by the evidence of inflammation and the formation of abscesses in different portions of the body.

Prognosis. Sapremia usually terminates favorably. The removal of the putrid products favors subsidence of the constitutional intoxication. The putrid material, however, may afford a favorable soil for the development and propagation of sepsis, so that the patient, when under observation, may be the victim of a mixed infection. Under prompt management sapremia generally terminates in recovery. Septicemia is exceedingly dangerous. Its manifestations are so varied that often when the patient survives she may be crippled for life, and under the necessity of sacrificing important organs. The progress of the disorder demands the most careful observation, with recourse to radical procedure whenever it is evident that local foci are influencing its continued propagation. Persistently high temperature, rapid, feeble pulse, a rapidly spreading peritonitis, a low muttering delirium, repeated chills, and the appearance of abscesses in different parts of the body are indications of the gravest import.

Treatment. Prophylaxis is the most important consideration, in treatment, but is so closely associated with the work of the obstetrician that we will not consider it. A woman who develops symptoms leading one to suspect the occurrence of a septic process should at once be subjected to careful investigation. This careful scrutiny is advised in order to prevent the confounding of other conditions with sepsis. Finally, a pelvic exploration should be made, and all decomposing products, such as blood-clots, portions of placenta, or remnants of decidua should be removed. The patient should be placed across the bed; if the abdomen is tender, an anesthetic should be given, and two fingers wrapped with gauze introduced into the uterus, which, with the hand over the abdomen, will permit the entire uterine cavity and wall to be explored thoroughly and all products and débris removed. The procedure not only removes the débris and contents of the uterus, but favors dislodgment of infected clots from blood-vessels and sinuses. The manipulation should be followed with an intra-uterine douche of sterile normal salt solution, or, better still, 1 per cent. saline solution composed of sodium carbonate gr. 2 1/2; sodium chlorid gr. 7 1/2; water 1000; formalin solution 1:1500–1000, or sublimate solution 1:3000. After irrigation the uterine cavity should be packed with iodoform gauze to be removed in twenty-four hours. If exploration of the uterus fails to disclose decomposing masses or other causes of sapremia the diagnosis of septicemia is justified. The conditions which point to the existence of pyemia have been indicated. In either septicemia or pyemia, intra-uterine manipulation will be unproductive of any result unless instituted early. The micro-organisms soon penetrate beyond the reach of local measures. Curetment, by affording fresh avenues for infection, is harmful. The uterine cavity may be irrigated through a double current tube, once with a hot 1 per cent. saline solution, or solution of formalin or bichlorid, to ensure removal of blood-clots or other decomposing material. Sublimate douches are preferably followed with normal salt solution to avoid the danger of mercuric poisoning.

The removal of decomposing products, irrigation of the uterus, and the internal administration of salines in sapremia, or putrid intoxication, usually establishes early convalescence. Not infrequently, however, there will be a marked rise of temperature after such a procedure, but it soon subsides. Sepsis, on the other hand, is caused by micro-organisms which have entered the blood, and kill, not so much by their presence, as by the toxins or poisons which they generate. Researches have seemed to demonstrate that these toxins or the killed micro-organisms injected into the circulation promptly generate an antitoxin which acts as an antidote to the original poison. My early experience in the treatment of sepsis by the administration of the antistreptococcic serum was such as to lead me to place great reliance upon its efficacy. Later this did not seem sustained. Recently, however, more careful methods of preparation render this treatment worthy of consideration. In severe cases, as much as ten cubic centimeters (two and a half drams) of the serum or 10 to 200 millions of the dead micro-organisms should be injected in twenty-four hours. In less severe cases, smaller doses, three to six cubic centimeters of the former, or 2 to 8 millions of the bacteria can be used. The serum or vaccine should be administered daily until the abnormal symptoms subside.

The advocates of serum-therapy and bacterial vaccines are doubtless correct in their demand that the material shall be recently prepared. Careful bacterial investigations of the secretions and blood of the infected patient are essential to accuracy in treatment as it is unreasonable to expect satisfactory results from the use of streptococcic serum or vaccines in staphylococcic infection. Unquestionably the use of autogenous vaccines would seem the more scientific procedure, but it is not always practicable, for obvious reasons, as the condition of the patient will indicate in many cases the probability of streptococcic infection. In others, especially, where there is room for doubt, it is the wiser plan to use the stock mixed vaccines. Henry Schwarz, M. D., (St. Louis. Am. Jour. Obst., LXII, 1910, 895) asserts as the result of careful animal experimentation that:

1. The use of bacterial vaccines must be based on bacterial diagnosis.
2. The legitimate field for the use of vaccines will be found in the localized infections produced by the colon bacillus, the gonococcus, and the various staphylococcic infections.
3. They were of no value in the strictly local streptococcic infection, and dangerous where partially localized.
4. The bacterial vaccines are contraindicated in all acute infections.

He seems to hope that more will be accomplished through the serums.

It is important that the serum should be used early and in effective dose. Neither serum nor vaccine can be regarded as having sufficient specific value to justify reliance on its action alone, to the exclusion of other measures to sustain the patient and maintain her ability to fight the disease. The patient's strength should be maintained by a nutritious, easily digested diet, supporting remedies, and the judicious use of stimulants. The greatest care must be exercised by the physician to employ his means to combat the disease with intelligent consideration. The untimely use of supporting remedies and stimulants is often more damaging than valuable. To use them prematurely may decide the battle against the patient. In order to keep the digestive tract undisturbed for the most effective nutrition, remedial measures, as far as conditions will permit, should be administered per rectum or hypodermically. Quinin in suppository (gr. v-x) three or four times daily; strychnin, atropin, tincture of digitalis, digitalin or adrenalin chlorid solution (1:1000) hypodermically should be given as indications demand. Action of the bowels secured by the proper use of salines facilitates the elimination of the infective products, though care should be taken to avoid undue depletion.

Intravenous injections of normal salt solution has been of great service to the surgeon in overcoming shock and carrying patients over a critical period. This procedure is also serviceable in low septic conditions as it increases the volume of the blood, dilutes the toxic material, promotes secretion and the consequent elimination of poisonous products. Chlorid of sodium (2 1/2 parts) with bicarbonate of sodium (7 1/2 parts) making a one per cent. solution has proved especially efficacious in septic conditions as it increases the phagocytes and the consequent ability of the patient to resist the progress of the infection.

The brilliant results achieved by Professor Baccelli, in 1889, in the treatment of pernicious malaria, by the intravenous injection of hydrochlorid of quinin, directed the attention of the profession to the intravenous injection of germicides. Baccelli later instituted the intravenous injection of corrosive sublimate in the treatment of syphilis, after the administration of mercury by other methods had failed. His experiments on the lower animals demonstrated the fact that albuminate of mercury, which was first formed, was redissolved in an excess of albumin.

The knowledge that micro-organisms enter the blood suggested the introduction of germicidal agents to render it an unfavorable soil for their multiplication. The difficulty has been to secure an agent to destroy the specific germ in the hemal circulation without inducing degenerative changes in the circulatory fluid. Carbolic acid, sublimate, and formalin have all been recommended as suitable agents for this purpose. In a case in which the conditions were such as to make it evident that death was imminent unless the poison could be arrested, I injected 1/8 of a grain of sublimate in 500 centimeters of normal salt solution. The following day the patient developed an infarct which cut off the circulation in the end of the nose, and she died at the end of forty-eight hours. However, as air had entered, due to the faulty apparatus employed, it is not justifiable to condemn the bichlorid as the cause. Formalin was commended particularly by Barrows, of New York, and Maguire, of London. The latter, in his experiments, injected solutions as strong as 1:500 into himself. This was followed by hematuria, albuminuria, cramp-like pains, and faintness. I have applied gauze, wet with formalin solution (1:1500–2000), to the peritoneum, with complete destruction of the endothelial covering of the involved surface, so that I should regard the injections of solutions of formalin, therefore, under 1:5000, as extremely dangerous, and as it has been claimed that it is germicidal in solutions of 1:200,000, a weaker solution still would seem preferable. As the simple injection of water into the blood-vessels causes degenerative changes in the blood-corpuscles, it would seem much wiser that these injections should be made in combination with normal salt solution. In cases, then, in which it is evident that the patient will succumb to the disease unless it can be arrested, we should feel justified in proceeding to extreme measures with the hope of affording relief; and with our present knowledge of conditions, I should favor a mercuric solution in combination with a normal salt solution as being the safest agent we can employ. It should not be given in greater strength than 1:5000.

Localization of infection may result in abscess formation in the uterine wall, in the pelvic cellular tissue, in the tube, in the ovaries, or in pyemic abscesses in various portions of the body. The presence of such local collections indicate prompt surgical interference. Necessarily, the procedure must depend upon the site and extent of the lesion. If an exudate or inflammatory collection can be reached by a vaginal incision, through which the contents of the cavity can be evacuated, its sac enucleated and removed, or the cellular tissue opened up and drained, more serious destruction of tissue often can be avoided. Where the uterus remains large and extremely tender, or presents indications of localized peritonitis or localized abscess formation, and the condition of the patient will permit, the abdomen can be opened and hysterectomy performed. It should be capable of demonstration that the uterus is the seat of irreparable damage or a focus for the continued distribution of infection before it is removed. I have been consulted as to the advisability of hysterectomy where the patients have recovered without operation, and even given birth to children subsequently. In doubtful cases the uterus and pelvis can be explored by a posterior vaginal incision and the opportunity thus granted for peritoneal drainage will often afford the required relief. The excision of a section of an infected vein has been successfully performed, but one must be satisfied that the condition is not diffuse before resorting to such a procedure.

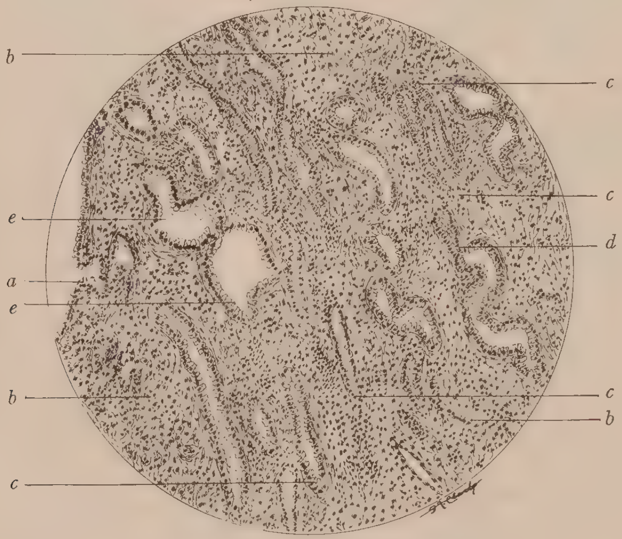


FIG. 319.—Interstitial Endometritis.

a. Free uterine surface. *b, b, b.* Hyperplasia of connective tissue. *c, c, c, c.* Obliteration of glands. *d.* Choking of gland from increase of fibrous tissue. *e, e.* Glands occluded and somewhat dilated.

When the temperature is elevated, the skin hot and dry, associated with tympanites and repeated vomiting, the most effective plan of treatment is to irrigate the stomach with hot normal salt solution, followed by intracolonic irrigation. The latter should be continued over several hours, or a quart of normal salt solution should be injected into the bowel every hour. The better plan is to elevate the foot of the bed and through a double rectal tube subject the rectum to more or less continuous irrigation with a one per cent. salt solution. The administration of large quantities of salt solution promotes elimination. The tongue and skin become moist, the secretion of urine increased, the pulse increases in volume, and the temperature becomes reduced.

245. **Chronic endometritis** is an inflammation of the mucous membrane of the body of the uterus. It rarely, if ever, is the consequence of acute endometritis, but more frequently follows subacute processes and long-continued hyperemia. It is divided by Ruge into glandular, interstitial, and mixed varieties, according to the structure of the mucous membrane most extensively involved. In all the entire structure of the membrane is necessarily more or less affected. With thickening of the mucous membrane the glands become elongated, dilated, bent, and tortuous. Cells become swollen and proliferated, resembling those of the decidua. The vessels of the deeper portion of the mucosa are dilated and in a state of congestion.

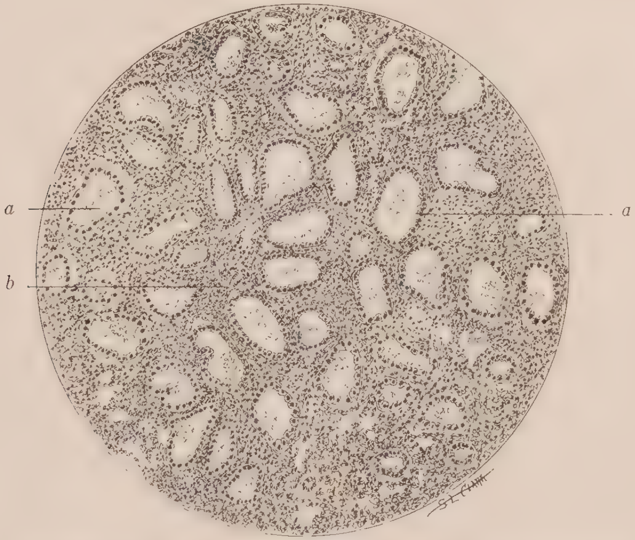


FIG. 320.—Hypertrophic Glandular Endometritis, showin Increase in Size and Number of Glands.

a, a. Glands dilated and containing secretion. *b.* Infiltration of leukocytes.

In peritonitis early drainage is desirable. It is accomplished readily by an incision above and parallel to each Poupart's ligament and through the posterior fornix of the vagina and the insertion of ropes of iodoform gauze between the openings. If the peritoneal involvement is extensive, a lumbar incision should be instituted.

The operation should be done expeditiously and with as little disturbance as possible, trusting to nature to eliminate the material when a vent has been supplied. The Fowler-Murphy treatment with continuous rectal instillation of salt solution should be employed. Compression on the tube should be regulated to permit the use of two quarts of solution in twenty-four hours.

The mucous membrane is frequently several times its normal thickness, soft, spongy, and easily scraped away. The surface presents vegetations or growths, which, according to De Sinety, are of three forms. In one, the tissue consists of dilated blood-vessels; in the second, of dilated, hypertrophied glands (Fig. 321); in the third, of embryonic tissue containing but few blood-vessels and only traces of glands. With these conditions are associated three kinds of discharge—sanguinolent, leukorrheal, and mucopurulent. As a result of the changes in the mucous membrane,

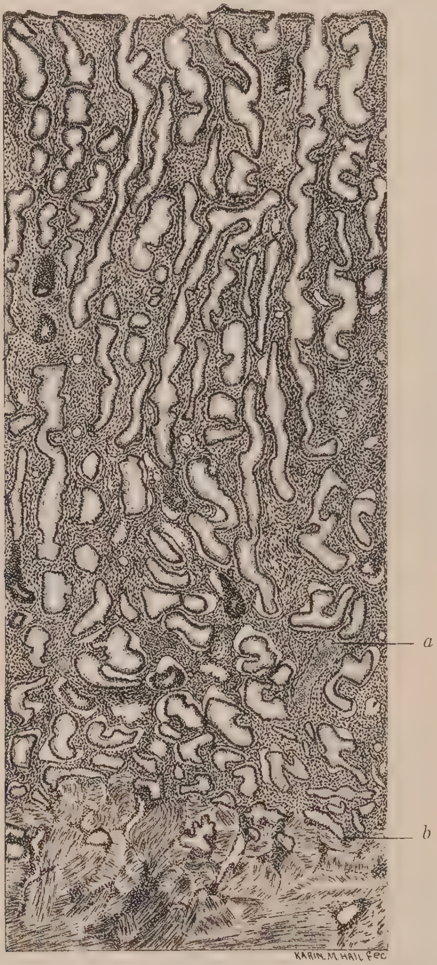


FIG. 321.—Hypertrophic Glandular Endometritis. Vertical Section through the Mucous Membrane.

a. Blood-vessel distended with blood-cells. *b.* Gland penetrating muscular wall.

not infrequently portions project as polypoid masses, which consist of either glandular or vascular structure. (Fig. 322.) In this condition the mucous membrane is thickened and granular in appearance, and the state has been called villous degeneration, or endometritis fungosa. With cell-proliferation in its connective tissue and the subsequent contraction of the gland its structure is compressed and obliterated, so that the surface is almost free from glands. Or, again, the orifices of the glands' ducts in places become occluded and cysts result. The hyperplasia of the uterine mucosa in some cases results in the desquamation of the epithelial layers at each menstrual period. This desquamation may take place in the formation of shreds or in a complete cast of the uterus, in which the orifices of the Fallopian tubes and the internal os are recognized. This condition is known as exfoliative endometritis, membranous dysmenorrhea, or, probably better, menstrual decidua. (Fig. 323.)

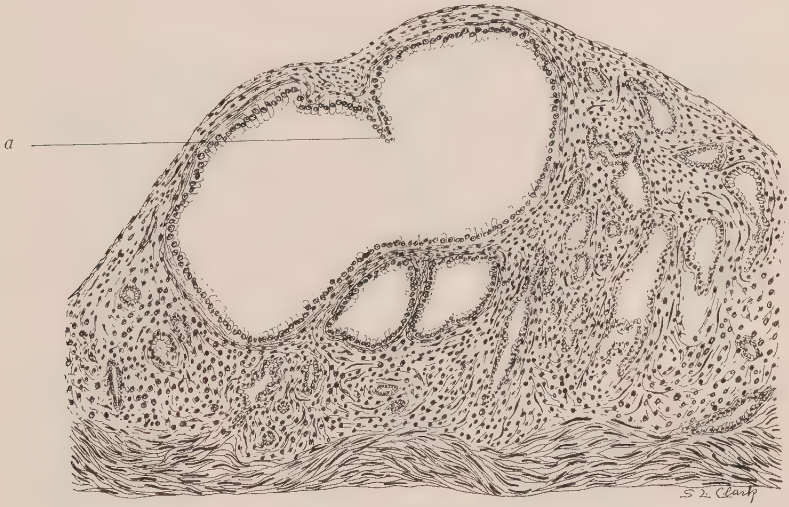


FIG. 322.—Polypoid Masses Associated with Chronic Endometritis. *a.* Glands greatly dilated, with destruction of the intervening septum.

Symptoms. The disease arises after abortion or labor, as a result of an attack of uterine inflammation, or an attack of gonorrhea. Occasionally, it may begin insidiously and without any assignable cause. It occurs usually in the multiparous, frequently in the later menstrual life. Nulliparæ are not exempt. Even virgins are sometimes affected when the condition is known as virginal endometritis. This occurs especially in narrowing or stenosis of the external os. A form of the disease occurs subsequent to the climacteric, known as senile endometritis. Endometritis is characterized by the following symptoms: leukorrhea and menorrhagia. The discharge from the body of the uterus is less viscid than that from the cervix. It may be clear, but more generally is mucopurulent; occasionally it is tinged with blood, so that the patient imagines herself continuously unwell. The discharge flows freely or there is an apparent accumulation. Retention of the discharge and its evacuation in considerable quantity occur when endometritis is complicated by retrodisplacements or when the os is small. The discharge may have an offensive odor and be so irritating as to give rise to extensive excoriation of the vulva. Excessive menstrual flow, or menorrhagia, may or may not be present. Occasionally, it will be so profuse as to occasion a suspicion of malignant disease and cause a profound anemia. The resulting loss of vasomotor tonus results in increased tendency to hemorrhage. Dysmenorrhea, or painful menstruation, is not so common as in disease of the appendages or in chronic metritis. It is especially marked when accompanied by the discharge of a menstrual decidua. The influence of endometritis upon conception is not fully determined, but the increased frequency with which women become pregnant subsequent to a curetment renders evident that it has a restraining influence upon the occurrence of conception. Endometritis is a prolific cause of abortion.

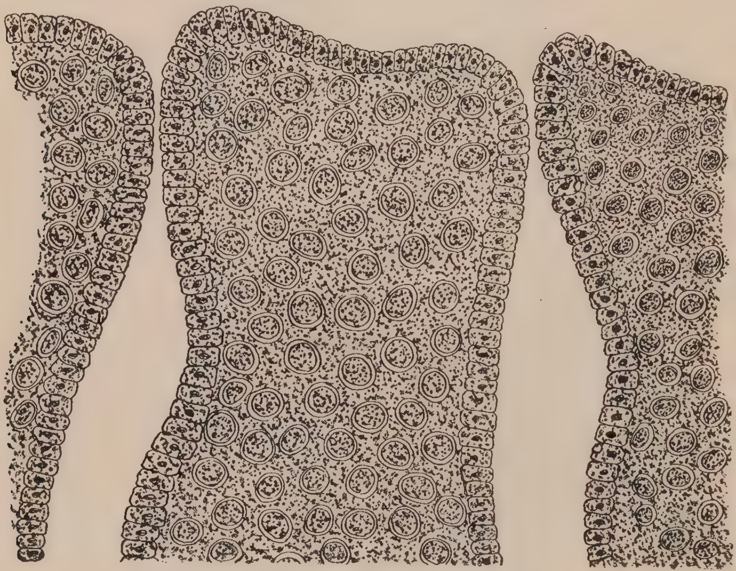


FIG. 323.—Membranous Dysmenorrhea.

Diagnosis. The existence of leukorrhea or of irregular and profuse menstruation, associated with enlargement of the uterus for which no explanation external to the uterus can be found, justifies the suspicion of endometritis. The history of abortion, or prolonged convalescence subsequent to labor, confirms the suspicion. The use of the curet is of incalculable advantage in determining the diagnosis. Portions removed with the curet will show small-cell infiltration of the entire glandular tissue, without glandular hyperplasia, or marked hyperplasia of glands with proliferation of the glandular epithelium. The epithelial cells become enlarged and granular, lose their cylindrical shape, and resemble the decidual cell. Endometritis, when uninterrupted, extends to the deeper structures, producing metritis. It predisposes to malignant change. When permitted to pursue an undisturbed course, it may involve the peri-uterine covering. Deposits occur in the cellular tissue about the ovary or around the orifice of the Fallopian tube, or the disease involves the pelvic peritoneum. Neglected cases result in cellulitis, salpingitis, ovaritis, peritonitis, the formation of abscesses, the destruction of tissue in the organs, and not infrequently, alas! in loss of life. Senile endometritis, is associated with retention of secretion which decomposes, producing an exceedingly offensive odor, and arouses the suspicion of malignant disease (Dunning). The examination of such a uterus reveals its walls thinned, the mucous membrane consisting of a thin layer of connective tissue covered with a single layer of flattened epithelial cells.

Treatment. Constitutional treatment is of marked value, and will be discussed with chonic metritis. Prophylaxis will require rigid asepsis during labor or abortion, as well as in making gynecologic examinations. A rise of temperature or the suspicion of the retention of a portion of placental débris should be considered as indicating the necessity for thorough use of the curet, free irrigation, and in many cases gauze packing. Laceration of the cervix or of the pelvic floor should have early repair. All suspicious discharges must be removed by treating the cause. Before the third or fourth day an endometritis of gonorrheal origin is best treated by frequent irrigation with antiseptic solution, such as permanganate of potash (1:3000-2000), mercurol (1 to 2 per cent.), protargol (0.5 to 1 per cent.). If the acute symptoms have subsided, paint the cervix, and where the os is patulous, the cervical canal, with 50 per cent. solution of ichthyol in water, or glycerin, and later, if the condition persists, curet and pack with iodoform gauze. Careful antiseptic or aseptic curetting is the proper form of treatment in all forms of endometritis, whether complicated or uncomplicated. In serious cervical lesions, with much eversion and thickening of the mucous membrane, curetting should be followed by Schröder's operation upon the cervix. Drainage is of incalculable advantage in endometritis when complicated with slight catarrhal salpingitis. It will also prove serviceable in mild forms of peri-uterine inflammation. Curetting is contraindicated in well-established pathologic changes in the adnexa and in chronic peri-uterine inflammation unless immediately followed during the anesthesia by an abdominal incision for the correction of the pelvic lesions. In addition to curetment, intra-uterine treatment consists in the employment of antiseptics and caustics.

Free drainage should be considered as a prerequisite to all intra-uterine treatment. The inflamed uterine canal is similar to a sinus. Unless the pent-up discharges have free vent, the irritation is aggravated. When the canal is patulous, large injections of a feeble antiseptic solution such as formalin (1:2000), normal salt solution, or a 2 per cent. solution of bicarbonate of soda through a return-current catheter can be employed. The latter solutions, when used, are as salutary as the more distinctly defined germicidal agents. If the cervical canal is insufficiently large, it should be dilated with laminaria tents, after which irrigation should be practised. In mild cases the canal may be swabbed, by means of a cotton-wrapped applicator, with tincture of iodin; in more severe cases, with carbolic acid. When the mucous membrane is thickened and tends to bleed or to furnish a profuse discharge, more active agents may be employed; silver nitrate, gr. xxx, to aq. destil., ℥ss–j; zinc chlorid, ʒj–iv to f℥j; chromium trioxid, gr. x–xxx, to f℥j; fuming nitric acid, acid nitrate of mercury, tincture of chlorid of iron, pencils of silver nitrate, zinc chlorid, zinc sulphate, copper sulphate, or formalin. When strong caustics are used, precautions must be practised to protect the healthy vagina from contact with the solution. Indeed, in my judgment the employment of the strong caustics is required very infrequently. More is to be gained where a strong effect is desired by the use of the curet and the subsequent applications of the milder agents, as argyrol (10 to 50 per cent.), protargol (5 to 10 per cent.), or the ordinary tincture of iodin. A mass of absorbent cotton should be placed beneath the cervix prior to the application, and the superfluous caustic should be removed by sponging before the pledget is withdrawn. Pencils are objectionable in that they produce sloughing of the cervical mucous membrane and cause the development of atresia.

Dilatation and the curet are generally recommended for membranous endometritis but have little influence in affording relief. Otto Maier recommends cotarnin phthalat gr. 3/4 in capsule every three hours, beginning three days before the flow and continuing through it. When other mothods fail, Toland advocates the application of Bier's suction glasses for fifteen to thirty minutes daily, a few days before and during the flow.

Tampons. Intra-uterine treatment should be supplemented by placing beneath the cervix a tampon, preferably saturated with a preparation of glycerin, a 50 per cent. solution of boro-glycerid in glycerin, a 10 to 15 per cent. solution of ichthyol in glycerin, or a 25 per cent. ointment of ichthyol in lanolin. The following prescription is an excellent astringent and antiseptic:

℞.	Pulv. alum.,	f℥j
	Acid. carbolic.,	℥vj
	Glycerin.,	Oj.

Various ointments, either astringent or alterative, with lanolin as a base, may be used upon the tampon. A tampon improves the circulation by raising and maintaining the uterus at a higher level. The antiseptic tampon may be retained from twenty-four to seventy-two hours, according to its character. When the tampon is not used, or after its removal, a vaginal douche of two or three quarts of hot salt water (110° to 120° F.) should be used twice daily, with the patient in the recumbent position. When using very hot injections cover the vulva and perineum with vaselin, to prevent burning. The employment of rock-salt, an ounce to the quart, in a douche, promotes its efficiency. Scarification under continuous irrigation will often prove of advantage, and is more effective than leeches. An iodoform gauze tampon should follow. Intra-uterine injections have been employed for endometritis, but should never be used unless the canal is sufficiently patulous to permit the escape of the superfluous fluid. The better plan is to employ a pipet or syringe by which one, two, or three drops may be introduced. Occasionally, even this small quantity will cause violent uterine colic. These attacks are not necessarily dangerous, but they are not calculated to encourage the continuation of treatment.

The treatment *par excellence* in chronic endometritis is the use of the curet. In senile endometritis the important consideration is drainage; to insure this, sometimes it may be necessary to employ a tube. The cavity should be irrigated frequently with an antiseptic solution.

246. Chronic metritis is an inflammation in the muscle-wall of the uterus, leading, when long continued, to increased connective-tissue formation. The term metritis is used in a comprehensive sense, and comprises conditions which have been described by different writers under such terms as chronic parenchymatous inflammation (Scanzoni); subinvolution (Simpson); diffuse proliferation of connective tissue (Klob); infarction (Kiwisch); hyperplasia of fibromuscular tissue, similar to fibroid tumors (Virchow); diffuse interstitial metritis (Noeggerath); irritable uterus (Gooch). The term may be criticized from a pathologic standpoint, as there is no chronic inflammation of the muscle-fiber of the uterus, but an increased amount of connective tissue, out of proportion to that of the muscle-fiber. Clinically the term is satisfactory, as it enables us to comprise a variety of conditions which may be developed from different causes but produce a similar group of symptoms. It has been objected that, by inference, there has been a profuse acute inflammation, which is not the case, as chronic inflammation of the uterus does not follow the acute. It is more correctly described as an increased tissue formation, dependent on long-continued congestion. The term chronic is applied to analogous forms of inflammation in other organs and structures of the body, as cirrhosis of the liver, which describes a condition similar to that which is found in the uterus. Subinvolution is, in some English books, described separately, though it is due to the same cause.

The differential diagnosis between subinvolution and chronic metritis is impossible, and the treatment of the two conditions does not differ. The altered condition of the uterus will vary with the period at which the patient comes under observation. In the early stages the organ is enlarged, hyperemic, and soft. Later, it may decrease in size, though it is still large, and then becomes hard, indurated, and anemic. The enlargement of the organ is uniform, so the shape is not altered. Upon opening the abdomen of such a patient the peritoneal surface will present a normal color, or patches of extravasated blood may be present. On section, in the early stages the tissues will be soft, hyperemic, easily incised; later, firm, cartilaginous, presenting a whitish color, the walls thickened, and the cavity of the uterus enlarged. Not infrequently the organ will be found as firm and dense as a mature fibroid growth. During the first period, De Sinety says, the dominant lesion is the presence of a large number of embryonic elements throughout the thickness of the muscular wall. These are more particularly situated around the blood-vessels, or they may form islands more or less separated from one another. The second period is characterized by two changes: marked dilatation of the lymphatic spaces; and localized hyperplasia around the blood-vessels. We may find it difficult to determine whether the muscular tissue remains normal, or is present in decreased quantity. Fritsch examined uteri removed for cancer, and found associated evidences of chronic metritis, in which the following pathologic changes were noticed: The arrangement of the muscular fiber and connective tissue is less regular than in the normal, and the latter is greatly increased in quantity. Blood-vessels are more numerous and tortuous. The vessel lumen is contracted, its tunica media is thickened, and the contour of the vessel is masked by the degeneration of the connective tissue in its wall. The lymphatic spaces, instead of being narrow clefts, are gaping; the peritoneum is thickened. Both Corneuil and Snow-Beck described an increased number of round and oval globules with amorphous tissue in the uterine walls. The increase in the size of the organ is due to the presence of this rather than to the increase of muscle-fiber.

Etiology.—The causes of chronic metritis are predisposing and exciting. The former may be divided into: (*a*) Those which operate by interference with the normal involution of the puerperal uterus; (*b*) those which are due to the production of repeated or protracted congestion. The first class comprises: (1) retentions within the uterus of portions of placenta, membranes, or blood-clots; (2) cervical lacerations; (3) pelvic inflammations subsequent to labor; (4) too short convalescence following delivery; (5) nonlactation; (6) repeated miscarriages. Two factors are essential to the accomplishment of involution: first, fatty degeneration of the muscle-fiber; second, removal of the products of degeneration. Now, subinvolution or failure of the uterus to undergo complete involution is due not to want of degeneration of muscle-fiber, but to substitution of connective tissue for the products of this degeneration. Metritis, then, is generally found in women who have borne children, and it has been asserted that involution is retarded by the removal of the ovaries, although a patient of mine who completed her gestation after the removal of both ovaries did not manifest any failure in the process of involution. Any irritation in or about the uterus will cause a chronic metritis. This explains the effect of retention of portions of the placenta or membranes, of lacerations of the cervix, and of the existence of peritonitis or cellulitis, as these conditions interfere with the circulation, which is also affected by premature getting up following labor. The organ is heavy, and the increased weight leads to its being displaced to a lower level, producing passive congestion. Passive congestion is decreased by any cause which increases uterine contractions; the physiologic stimulus of nursing excites contraction reflexly through the mammæ and favors involution. Abortions especially are instrumental, for the reason that the patients do not take as much care of themselves as they would subsequent to a labor, and the stimulus of lactation is absent. After an abortion conception is likely to occur before the process of involution is complete, and this favors the recurrence of abortion.

The second class of cases, which operate through production of repeated or protracted congestion, includes displacements of the uterus, the presence of tumors in or near it, and any condition which produces increased flow of blood to the uterus, such as endometritis and the free use of caustics. To this class also belong malformation, incomplete development, congenital anteflexion, conic cervix, stenosis of os, improper clothing, exposure to cold, and masturbation. Metritis is favored at each menstrual period, by exposure to cold, especially when the uterus is displaced or the cervix is contracted or lacerated, by excessive copulation or its practice during menstruation, and by gonorrheal infection from an incompletely cured husband.

Chronic contusions from the use of a pessary may engender the inflammation. The intra-uterine stem-pessary is capable of doing the most injury.

Symptoms. In the large majority of cases the patient will date her trouble from a confinement. Not infrequently she will report repeated abortions, and that she subsequently regained her health very slowly.

The symptoms are not characteristic, but are similar to those found in cancer, fibroma, displacements, and other local disorders. They are: weakness; pain or aching over the lower lumbar and sacral regions; a sensation of weight and bearing down, as if the pelvic organs were about to be extruded; an apparent loss of power in the lower extremities; points of anesthesia over the anterior surface of one or both thighs; painful contractions of the uterus; irritable bladder; constipation; loss of all pleasurable sensation during the sexual relation; pricking pain in the eyes and weak sight; photophobia; occipital pain, but more frequently pain over the coronal suture; and disturbances of menstruation, as dysmenorrhea, abnormal bleeding, menorrhagia, or metrorrhagia. In weak patients are found amenorrhea, leukorrhea, hydrorrhea, hydrorrhea gravidarum, puerperal hydrorrhea associated with retention of portions of placenta and clots. Not infrequently there are loss of appetite, nausea, dyspepsia, and enfeebled assimilation. The patient is pale, anemic, and exceedingly weak, with dark circles beneath her eyes. She suffers from palpitation and a sense of oppression, is exceedingly despondent and profoundly melancholic. Acute mania, epilepsy, hysteria, and neurasthenia are occasionally induced, and are always aggravated by the existence of chronic metritis. The diseased condition under discussion is responsible for the majority of cases of semi-invalidism. The patient is continuously conscious that she has a uterus; the distress is increased by exercise and lessened by rest. The constipation and digestive disturbance are aggravated and increased by dread of pain and by her sedentary habits. The patient can suffer from acute exacerbations, with diarrhea and rectal tenesmus, as a result of extension of the inflammation to the rectum.

Menstrual disturbances are common, and largely induced by the accompanying endometritis, which is called hemorrhagic endometritis, from the bleeding.

The hemorrhage probably is due quite as often to the diminished contractile power of the organ as to the substitution of connective tissue for the muscle-fiber. The associated disease of the mucous membrane adds to the dysmenorrhea. This may precede, be simultaneous with, or follow the period, but is generally continuous with it, in the form of increased backache, pressure, and pelvic discomfort.

Leukorrhea is produced by alterations of the uterine mucous membrane. Frequently in the aged a hydrorrhea develops, with a periodic discharge so offensive as to lead to the suspicion of the development of malignant disease.

Sterility is a natural consequence of the prolonged existence of chronic inflammation, not only from alterations in the structure of the wall and mucosa, but probably much more from the superadded changes in the pelvic peritoneum, affecting the tube and ovaries. The escape of the ovum may be prevented by extensive adhesions fixing the ovary, or through thickening of the ovarian tunica albuginea, which prevents its exit from the maturing Graafian follicle. The Fallopian tube may furnish the obstacle, through closure of its abdominal or uterine end, or by stricture along its course.

In the earlier stages of the inflammation the susceptibility to pregnancy may be engendered by alterations in the mucosa which unfit it for the complete nutrition of the developing embryo, and abortion or premature discharge of the contents follows. The substitution of connective for muscular tissue, by the consequent uterine inertia, at the completion of gestation, renders delivery tedious and increases the danger of post-partum bleeding.

Chronic metritis is responsible for many of the sofa and bath-chair population—the nervous, debilitated, dyspeptic women who wander from physician to physician or crowd the watering-places during the summer. The condition is frequently unrecognized and untreated, and the patient is condemned to suffer deeper and deeper wretchedness.

Physical Signs and Diagnosis. The uterus is uniformly large. Its walls are firm and rigid—in later stages almost as resistant as a fibroid tumor.

The organ may be in a normal position, situated at a lower level, or displaced. It may be freely movable; more or less fixed; readily outlined or fixed in a mass of pelvic exudate. The organ is sensitive to pressure.

Differential Diagnosis. Pregnancy in the early stages presents a history of cessation of menstruation and of increased discharge. The uterus is enlarged, the cervix soft, while the body bulges like a jug and is not resistant. Cancer usually involves the cervix, though the body may be the site of its origin. When the latter is involved the bimanual examination will disclose points of increased resistance. Bleeding results from severe manipulation, and an offensive, thin, and serous discharge will probably be present. Pain is a frequent symptom, and occurs most severely toward evening. The use of the curet or digital exploration after dilatation with tents may be required to establish the diagnosis.

The curetted tissue in cancer is friable from infiltration, exhibiting under the microscope the characteristic cellular structure.

Small fibroids are frequently difficult to recognize, especially when interstitial or submucous. The irregular enlargement, well-defined points of resistance, and frequently intermittent pain are diagnostic. Digital exploration of the uterine cavity determines the presence, size, and situation of the growth. Salpingitis is often associated with metritis, when it may be difficult to determine which predominates. A small ovarian tumor may cause uterine hemorrhage.

Rectal disease often produces symptoms simulating chronic metritis. The general health may be so affected as to cause the local manifestations to be overlooked. Thus, the patient may complain of persistent cough, difficult breathing, or progressive emaciation, or the stomach may be the source of trouble, causing loss of appetite, flatulence, and gurgling, and presenting other evidences of dilatation. She may have precordial anxiety, palpitation, or cardiac and vascular murmurs.

It is a good rule to make a careful uterine examination in all cases of chronic disease.

Course and Prognosis. Metritis in all forms is obstinate and rebellious. The mucous membrane, muscular wall, and serous covering in turn are affected, followed by uterine sclerosis, cyst formation, and, finally, chronic metritis. In alterations of structure we cannot hope to cure in the sense of restoration of altered tissues; we can hope only for arrest of the process, relief of congestion, and amelioration of unpleasant symptoms.

Treatment. The best treatment is preventive. It consists in thoroughly emptying the cavity of the uterus after labor; in early repair of lacerations; in the relief of inflammatory conditions existing about the uterus; in stimulating involution of the organ by hot vaginal douches; in the administration of ergot and remedies that will facilitate the contraction of its muscle-fibers; in the exercise of such measures as will diminish congestion; in preventing the patient from rising too early from bed after pregnancy or abortion, and, when the condition exists subsequently, obliging her to remain in bed several hours daily, and to avoid sedentary occupations and long standing. While it is important that the patient should have sufficient rest, it is equally desirable that this should not be excessive. A certain amount of exercise in the open air is as desirable as rest. Tight clothing should be excluded. If the abdominal muscles, however, are very much relaxed, a snugly fitting abdominal binder affords great comfort and relief. This relaxation of the abdominal muscles is not infrequently associated with relaxation of the vaginal walls, when the use of a ring-pessary gives comfort. The circulation of the pelvis should be stimulated by vaginal douches of either hot or cold water. The latter are more stimulating, but few patients can employ them. Patients should take a hot douche containing rock-salt, at a temperature of 103° F. to 120° F., for ten or fifteen minutes before retiring. These douches are more effective when the patient is in the recumbent position. She can lie across the bed with her pelvis upon a basin or rubber pad, which should drain into a pail below, while her feet rest upon chairs. A douche bag, containing at least three pints, should be placed three feet above the level of the patient. Prior to its use the vulva and perineum should be coated with vaselin, to protect from the heat. The tube should be introduced to the cervix, and from three to ten pints of fluid should be used with each douche. Occasionally, warm baths should be used simultaneously with the vaginal douche. A cold hip-bath in the morning will be of great service. Medicated baths and waters are often of value. A course in hydrotherapy will frequently be serviceable. In catarrh or for scrofulous and chlorotic patients iron waters are beneficial. In nervous patients the character of the water is unimportant, but the patient should be encouraged to take large quantities. With dyspeptics, alkaline waters are desirable. In the lymphatic and scrofulous cases waters impregnated with chlorid of sodium are very efficient. These are also of value in some forms of chronic metritis where engorgement of the uterine body predominates. Patients not infrequently derive great advantage from change of air or scene, new surroundings, new relations, or a visit to the seashore or country. Constipation should be combated, preferably with foods, such as vegetables, Graham bread, prunes, nuts, and raisins; often effectively with other agents, as a teaspoonful of white unground mustard in water at meals; enemas to which glycerin is added; the administration of mineral waters—Friedrichshall water, Carlsbad salts, or Hunyadi János. The Carlsbad salts are of particular value to bilious patients. A teaspoonful should be dissolved in a glass of water and drunk in repeated sips during the morning. Friedrichshall and Hunyadi act best when mixed with equal quantities of hot water. A good mixture is a tablespoonful of the following preparation:

℞. Magnesii sulph.,.............................. ʒvj
Quinin. sulph.,.............................. gr. xxiv
Acid. sulphuric, dilut.,
Tinct. capsici,..............................āā fʒj
Aqua,..............................ad f℥vj M.
Sig.—Tablespoonful three times daily.

Contraction of the uterine muscles may be increased by the administration of ergot, which should be given in doses of gtt. xx to fʒj of the fluidextract t. d. When the condition is complicated with menorrhagia, extract of hydrastis canadensis may be combined. An effective prescription would be a mixture of ergot and hamamelis. (Section 95.) Potash salts are especially beneficial in chronic inflammation of the uterus. Chlorate of potash is highly recommended by Tait. Iodid of potash, however, is equally effective, and, when the patient is nervous and restless, may be combined with a bromid, giving of the iodid, gr. v, with bromid, gr. x, largely diluted with water, three times daily. Potash salts may be administered in the bitter tonics, as in compound tincture of cinchona or compound tincture of gentian. In the anemic and debilitated, iron, strychnin, quinin, arsenic, cod-liver oil, and malt extracts are beneficial. The general health should be carefully watched and any deranged condition of the various organs should be corrected. During the menstrual period patients should be confined to the sofa. When pelvic distress is marked, or metritis complicated by inflammation in the surrounding structures, benefit will be derived from painting with counterirritants, in the form of small blisters over the inguinal region, or the use of iodin or of croton oil. A good mixture is croton oil, one part; tincture of iodin, two parts; sulphuric ether, five parts. This can be painted over the hypogastric and iliac regions until a crop of pustules arises. Then the application should be discontinued until the pustules have healed. Exercise care not to allow the application to be made in the groin. Blistering fluid may be applied to the cervix and to the vault of the vagina, or tincture of iodin, or a combination of tincture of iodin and glycerin, may be thus used. Scanzoni advocated this application:

℞. Potass. iodid.,................................ gr. iv
Glycerin.,................................ ♏xxx.

When metritis is complicated by cervical catarrh, puncturing or scarifying the cervix, under an antiseptic stream, will be beneficial. Considerable depletion can thus be effected and the patient relieved. After the bleeding has stopped, a tampon of cotton and gauze, saturated with one of the preparations of glycerin, will prolong the depletion. A tampon raises the uterus to a higher level and improves its circulation, while, medicated with glycerin, it has a depletive or cholagogue effect upon the vessels of the cervix, causing a profuse watery discharge. The patient may be instructed how to introduce these tampons, and allowed to use them daily. A tampon saturated with a 50 per cent. solution of boroglycerid in glycerin, a 10 to 20 per cent. solution of ichthyol in glycerin, or carbolic acid (1:16) may be kept in place for one to two days. A tampon anointed with one part of ichthyol to four of lanolin is valuable when more or less irritation of the vagina is associated with the uterine lesion. In laceration of the cervix, where it has subsequently become hypertrophied, Emmet's operation is of service

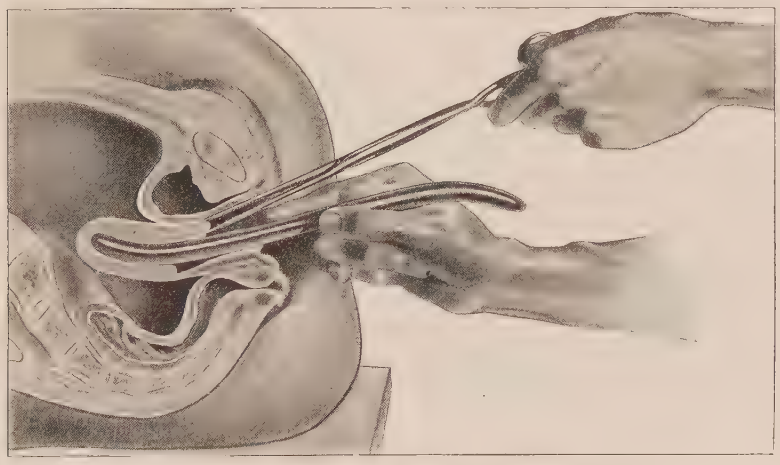


FIG. 324.—Uterus Dilated with Graduated Bougies.

in relieving the congestion and promoting involution of the organ. If the cervical mucous membrane is much everted, with papillary projections and eroded surfaces, amputation of the cervix by the single-flap method advocated by Schröder (Section 208) will be more effective. Any disturbances of menstruation, such as dysmenorrhea and menorrhagia, should receive treatment suitable for endometritis. (Section 243.) For this condition, as well as for the chronic metritis, dilatation and curettage of the uterus are of value. The dilatation is preferably done with Pratt's dilators, as these instruments gradually stretch the uterine canal without danger of tearing, unless the dilatation is excessive, which may occur in the use of the parallel-bar dilators.

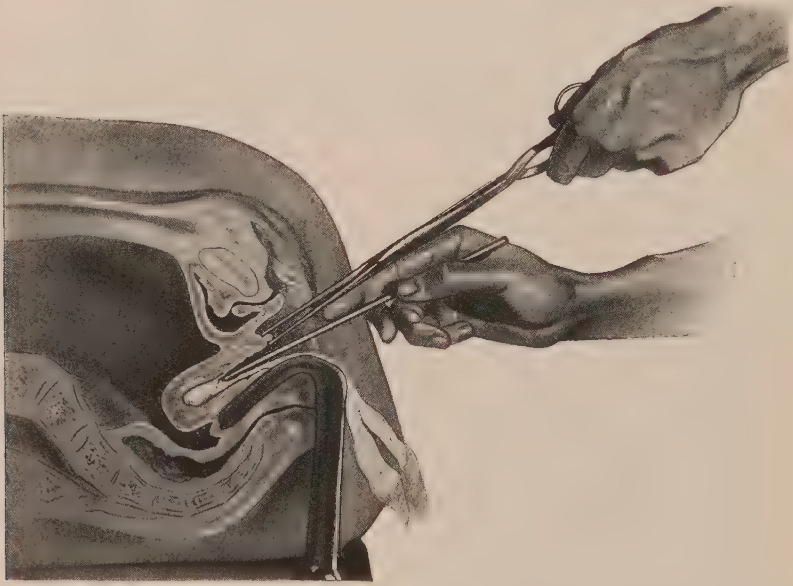


FIG. 325.—Uterine Cavity Packed with Gauze after Dilatation.

After preparation of the patient (Section 131) she is placed upon her back, the uterus is exposed by the Edebohls speculum, the cervix is seized and fixed with a double tenaculum, preferably with two, when there will be no tearing out under the strain of dilatation, and the bougies are introduced, thus gradually dilating the cervical canal. The dilatation is followed by the use of the curet. This instrument may be blunt or sharp; the latter is preferable, if carefully used. The handle of the instrument should be perforated, so that the surfaces can be irrigated as the curetting is done. The instrument is held lightly between the thumb and finger, is passed into the uterus and drawn down on all sides of the organ in long sweeps, paying particular attention to the angles of the body and to the orifices of the Fallopian tubes. The use of the curet in this manner does not remove the entire mucous membrane. Should it do so, the mucous membrane would be regenerated from the portion of the glandular structure which penetrates the muscular wall. The curettage may be followed by swabbing out the uterine cavity with tincture of iodin, a combination of tincture of iodin and carbolic acid, perchlorid of iron, or preferably a saturated solution of iodoform in ether. When any of these agents, except the last, are used, the uterus should be irrigated again, thus removing any clots and superfluous medicine. If bleeding is slight, the uterine cavity need not be packed. When considerable discharge exists, iodoform gauze packing should be used. Gauze packing is serviceable first in that it acts as a tampon, decreasing the danger of bleeding or of the formation of a blood-clot, which could become infected and cause extension of inflammation to surrounding structures. Second, by its pressure upon the surface it favors exudation and bars the entrance of septic material to the uterine sinuses; third, by its capillary action it affords a limited amount of drainage; fourth, by its presence as a foreign body it stimulates uterine contraction and promotes the process of involution. The vagina is cleansed carefully and a gauze pad is placed within it to support the uterus. This gauze dressing may be permitted to remain two or three days. When it is removed the vagina should be irrigated once or twice daily with a bichlorid formalin or, better, chlorid of sodium solution. When the uterine cavity has been the seat of extensive inflammation, with a predisposition to hemorrhage, the removal of the gauze may be followed by uterine irrigation through a double-current catheter. In hydrorrhea or pyometra in the aged it is very important to make sure that drainage is established. The accumulation of fluid within the uterine cavity makes the uterus a sac whose contents become infected and produce an occasional profuse discharge, causing the patient great alarm. Drainage should be insured, when necessary, by the introduction of a drainage-tube, through which the cavity is well irrigated and cleansed. Remedies should be applied to the uterine cavity to establish a healthy inflammation and arrest the abnormal accumulation. If hydrometra or pyometra which a pessary fails to correct is associated with a displacement of the uterus, the advisability of hysterectomy should be considered, particularly when the woman has passed the climacteric. Uterine adhesions or peri-uterine inflammation need not contraindicate curettage necessarily, as frequently the increased drainage thus secured will result in the relief of the peri-uterine disease. In patients who have been for a great length of time exceedingly nervous, hysteric, with general health destroyed, suffering from delusions or illusions, exceedingly irritable temper, a source of worry and distress to the family and to themselves, no better plan of treatment can be instituted than that advocated by Weir Mitchell for neurasthenic patients. This treatment consists in placing the patient in bed; at first upon a distinct milk diet, with careful regulation of the bowels, correction of any disordered condition of the alimentary canal; and, later, forced feeding, with as large a quantity of food as the patient can properly digest. She is under the control of a discreet, careful nurse, who allows her to take no exercise—nor even to move without assistance. In place of exercise she is given, once daily, thorough massage, thus carrying forward the blood-current, stimulating the absorption of waste material, and causing the introduction into the uttermost parts of the body of blood containing oxygen. The anemia which characterizes such patients is thus rapidly overcome, the number of red blood-corpuscles greatly increases, while the elimination of waste material is promoted. Once daily she is given an application of the faradic current—general faradization. She is isolated from the members of her family, and during this period of isolation is brought under careful mental discipline, which aims to stimulate her ambition, to overcome her subjection to the abnormal condition. At the end of six weeks or two months the patient undergoes a complete physical and mental change.

247. **Inflammation of the Fallopian tube** is a frequent result of infection, and the gravity of the physical changes is directly in proportion to the virulence of the poison. Gonorrhea and sepsis are the most frequent forms of infection which invade these organs. The invasion may occur through the uterus by the continuous mucous membrane, or through the blood-vessels or lymphatics, the former being the more frequent. Inflammation may involve the mucous membrane, the muscular wall, and even the peritoneum. It may be catarrhal or suppurative. Gonorrheal infection most frequently reaches the tube by the mucous membrane of the uterine body, and is more prone to involve the tubal mucosa, resulting in either catarrhal or suppurative salpingitis. It may, however, pass rapidly over the surface epithelium into the deeper structures of the tube, and causes profound destruction. Infection in rare instances enters

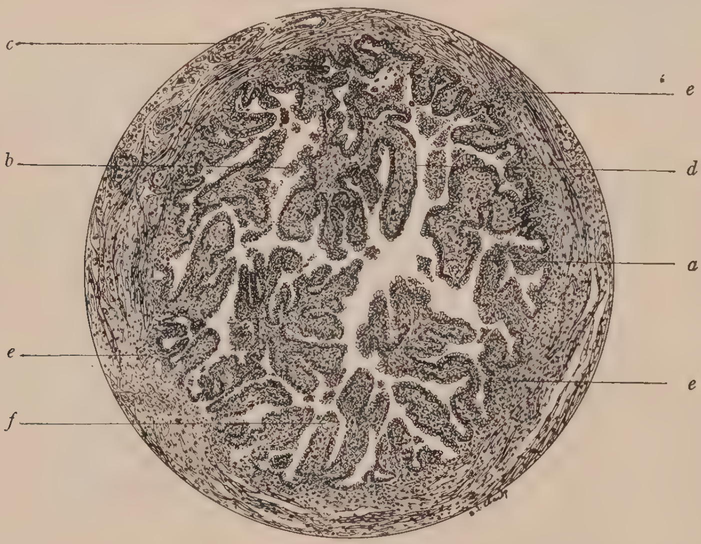


FIG. 326.—Acute Salpingitis.

a. Swollen and edematous fold. *b*. Inflammatory exudate. *c*. Dilated blood-vessel. *d*. Desquamation of epithelium. *e*. Infiltration of leukocytes. *f*. Disintegration of longitudinal fold.

through other avenues such as an inflamed or diseased appendix, especially upon the right side, through adhesions to a knuckle of intestine, particularly if the tube contains a collection of blood, and, finally, through the peritoneum, in which case, however, the infection is generally tubercular. The entrance of infection into the tube is followed sooner or later by

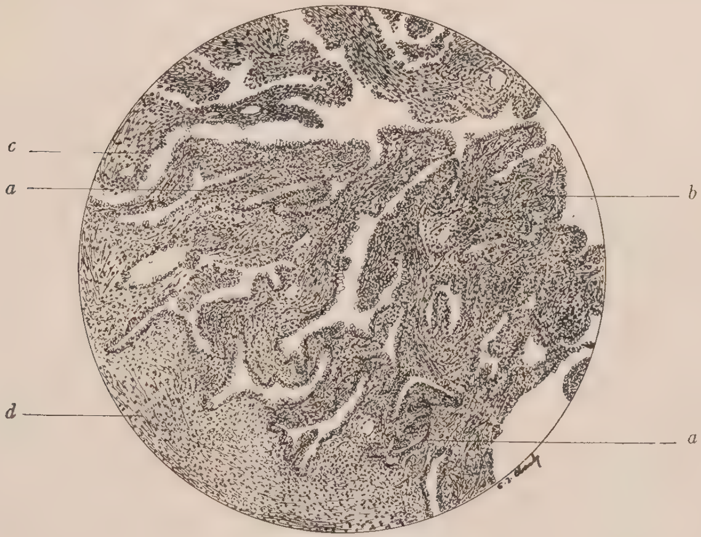


FIG. 327.—Chronic Salpingitis showing Agglutination of Folds.
a. Union of folds forming gland-like areas. *b.* Thickened and retracted fold. *c.* Desquamation of epithelium. *d.* Hyperplasia of tubal wall.

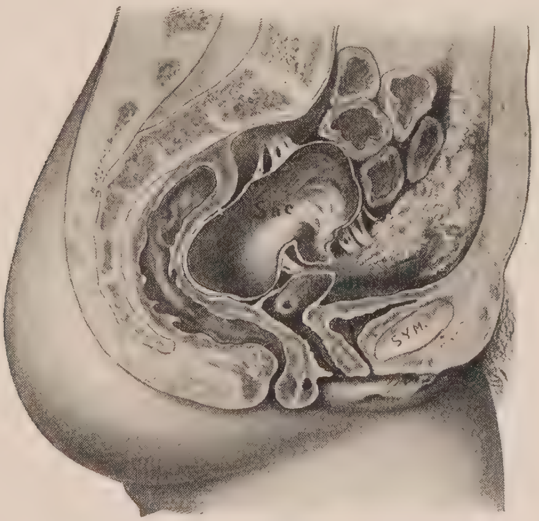


FIG. 328.—Extensive Pus-collections with General Adhesions.

evidences of inflammation. The epithelium becomes swollen, edematous, and granular, with the infiltration of inflammatory materials into the deeper layers. Serous effusion takes place into the tubal canal. (Fig. 326.) Loss of the cilia from the epithelium also occurs, especially upon the free surface, while they may be retained upon that portion lying between the folds. The epithelium will be found well preserved upon the surface of the tubal mucous membrane even when suppurative processes exist. (Fig. 327.) The irritating discharge from the tube leads early to irritation of the peritoneum and agglutination at the abdominal end of the tube, while the swollen structures obstruct the uterine orifice. The exudate which collects in the tube may be serous or purulent, according to the virulency of the infection and the resistive force of the patient. In either case the exudation is likely to increase, forming a clear serous collection in the one case which is known as hydrosalpinx or sactosalpinx, while the virulent process (Fig. 328), which results in a more or less extensive pus-collection, is called a pyosalpinx. (Fig. 329.) Occasionally the excessive hyperemia or a partial twisting of the base may cause rupture of the blood-vessels with an intratubular accumulation of blood. This condition is denominated hematosalpinx. It is, however, more frequently associated with the retrogressive processes of ectopic gestation. As a result of the inflammatory process the tube may assume the form of a simple sac, which gradually becomes distended until it attains a large size, and becomes a thin-walled cystic tumor. If the peritoneal wall has not been involved, the tumor may remain freely movable, whether it contain serum or pus. Such a sac may, occasionally, become twisted upon itself until the venous circulation is partially or completely obstructed, and then rapid increase in size results from the hemorrhage, which takes place not only into the sac, but also, occasionally, into the peritoneal cavity.

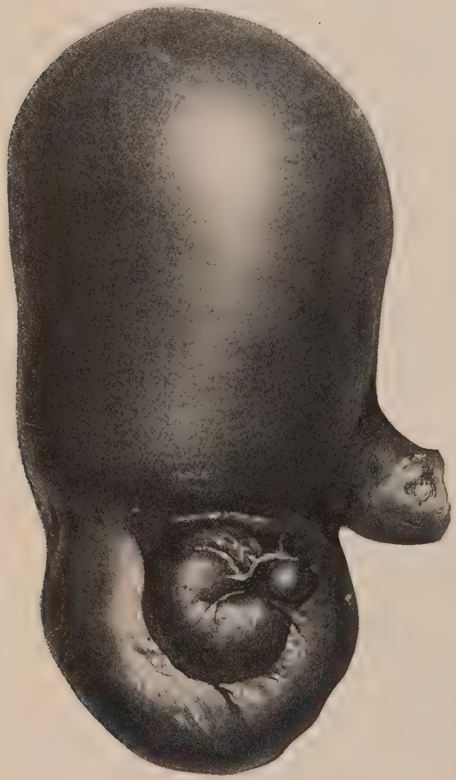


FIG. 329.—Pyosalpinx.

I saw in consultation a young girl who had an acute attack of pelvic inflammation. Examination revealed a large mass on each side. That on the left was situated above the uterus, and the one on the right posterior to and below the fundus. I performed an operation. So much blood was found in the abdomen that ectopic gestation was suspected. The hemorrhage in this patient came from the left tubal mass, the neck of which was twisted near the uterus. The tubal sac was dark (Fig. 332), and covered with clotted blood, which also filled that side of the pelvis. The right sac was clear and free from blood. Both sacs were found to contain pus, the left being mixed with blood. Both tubes were free from adhesions. Sometimes the distention of the tubal sac overcomes the swelling of the mucous membrane of the uterine end, and, therefore, its opening remains patulous and permits its contents to escape, after which the sac attains a favorable position. Such a condition may lead to occasional discharges of a considerable quantity of fluid through the uterus, giving rise to the phenomenon known as hydrops tubæ profluens, or intermittent hydrosalpinx. Inflammation of the tube involving its muscular

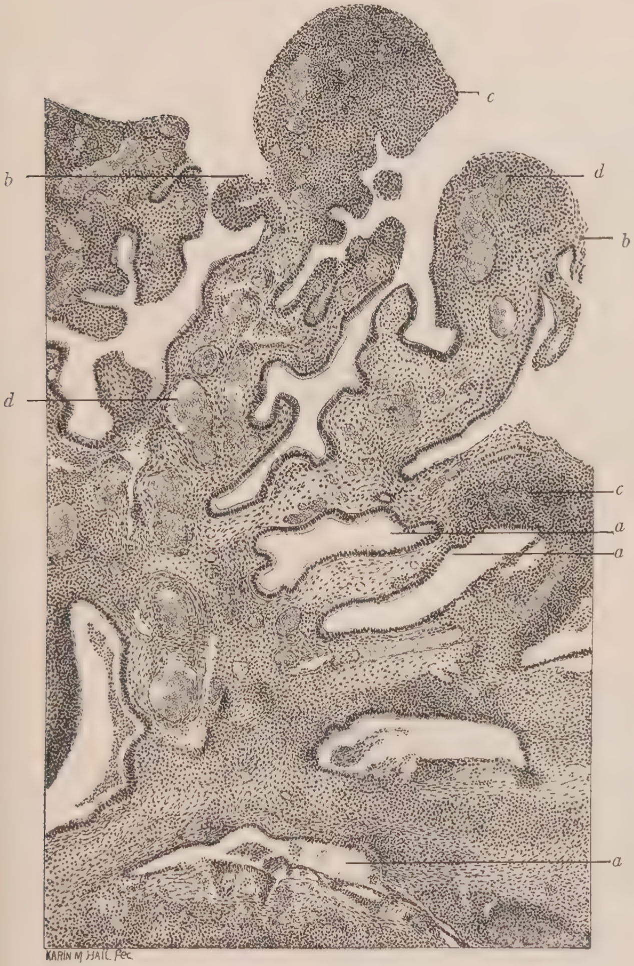


FIG. 330.—Section from Wall of Pus-tube. *a, a, a.* Folds matted together forming gland-like spaces. *b, b.* Folds undergoing dissolution. *c.* Shows complete desquamation of epithelium covering folds. *d, d.* Blood-vessels distended with blood-cells. *e.* Leukocytic infiltration.

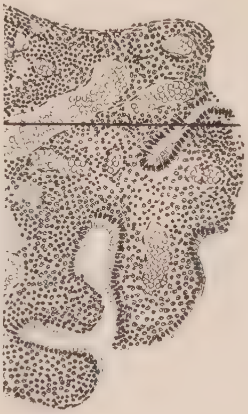


FIG. 331.—Single Fold from Wall of Pus-tube, enlarged. Line through upper portion shows area of extensive hyperemia.

wall causes a shortening of its longitudinal muscular fibers, which, owing to the mobility of the subserosa, permits the fimbria to be drawn into the tube and the peritoneum to be pushed over it like the prepuce over the glans penis in phimosis. (Fig. 333.) The peritoneal edges coming in contact are agglutinated, and the tube is sealed up. If the fimbriæ are not completely withdrawn, the protruding fimbriæ may serve as an avenue for leakage in subsequent distention of the sac and thus cause recurring attacks of localized peritonitis. (Fig. 334.)

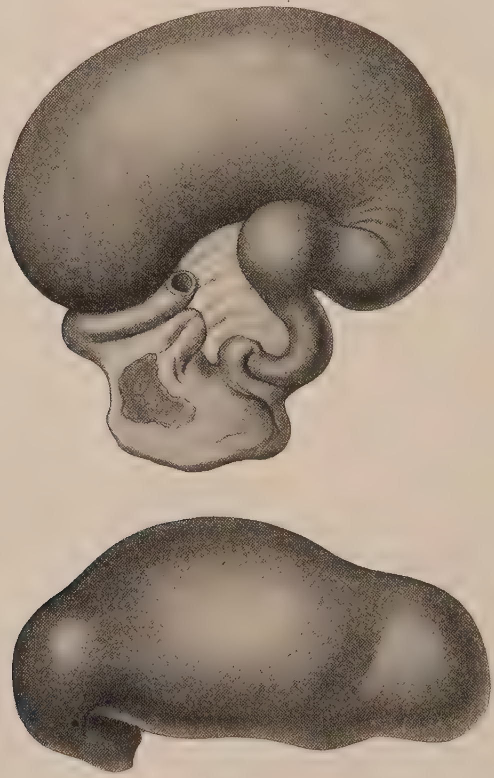


FIG. 332.—Distended Pus-tubes Removed from Young Girl.

A. Tube whose pedicle was twisted. Sac filled with blood and pus. *B*. Right tube filled with pus.

The tubal inflammation, instead of forming the cystic tumor already described, may result in extensive small-cell infiltration and thickening of the longitudinal folds, which necessarily decreases the caliber of the tube. Furthermore, in places the edges of the folds lose their epithelium, become more or less adherent, and upon microscopic section present the appearance of distended glands. Such a condition has been called salpingitis cysto-adenosa, but this term, like salpingitis follicularis, pachysalpingitis, and other designations, is an unnecessary distinction. The inflammatory infiltration frequently involves the folds and wall of the tube, producing such hyperplasia of these structures as almost to obliterate the tubal canal and to form a large sclerosed mass. The contraction of the circular fibers may cause the formation of a series of small sacs, each of which is independent of the others. The only relief is afforded by extirpating the tube. In the virulent infection the peritoneal envelope of the tube becomes involved by extension from its abdominal end or through its walls, and extensive adhesions unite it to coils of the intestine, the uterus, the ovary, or the pelvic peritoneum. The enlarged and swollen tube drops down into the retro-uterine cul-de-sac, and generally becomes adherent to the sigmoid flexure or side of the rectum. As the sac becomes more and more distended the union thus formed may permit the establishment of a communication with the lumen of the bowel, through which the tubal abscess drains. The tube of one side, dropping into the pelvis, may become adherent to the extremity of the other and form a common pus

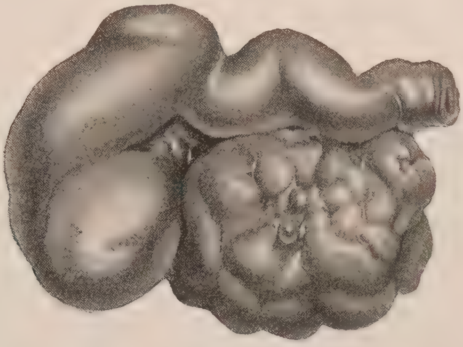


FIG. 333.—Convoluted Fallopian Tube from Perisalpingitis.

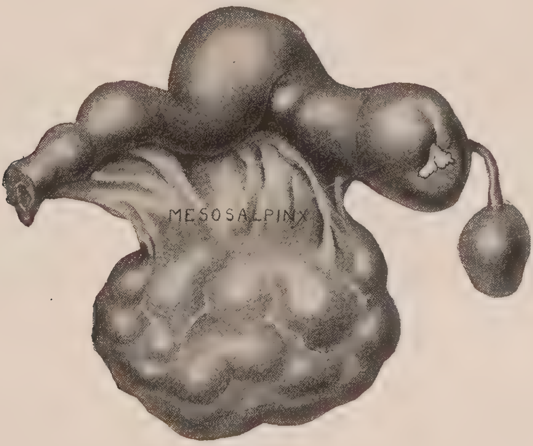


FIG. 334.—Incomplete Inflammatory Closure of the Fallopian Tube. Portions of Fimbriæ Unretracted.

cavity, which may attain a large size. (Fig. 333.) Infection of Douglas' pouch may follow rupture of the tube, causing a walled-off abscess which fills the entire pelvis. The intimate association of the abdominal orifice of the tube with the ovary causes frequent adhesions between these organs, resulting in intimate fusion of the involved structures, and rendering it difficult sometimes to differentiate between the two organs. Occasionally they appear as a tubo-ovarian tumor or a fused inflammatory mass, which may contain serous fluid or pus.

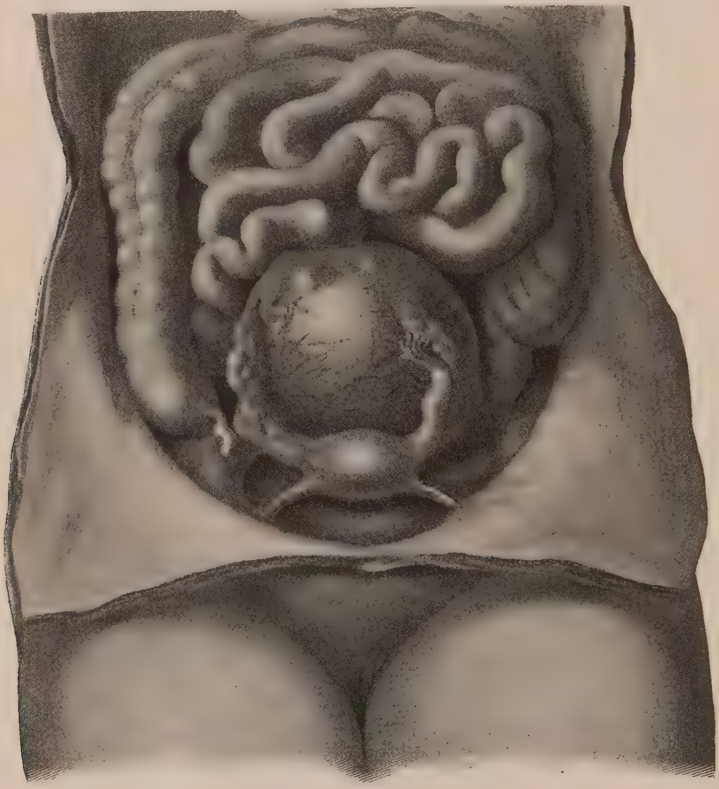


Fig. 335.—Double Tubo-ovarian Collection.

Physical Signs. Tubal inflammation has no characteristic symptoms. If a patient has had an acute pelvic inflammation, characterized by extreme tenderness in either pelvic region, and aggravated by motion, it is justifiable to conclude that the possible pelvic peritonitis had its origin in a tubal inflammation. When each menstrual period is followed by pain and tenderness in the inguinal regions, tubal inflammation is very probable. A normal tube is not usually palpable. In diseased conditions, however, especially when the tube has become thickened by salpingitis or parenchymatous inflammation, it may be recognized as a more or less thickened cord which slips under the finger and is quite sensitive. When hyperplasia of its connective tissue occurs, the tube is felt as a contracted, distorted, nodular mass, closely associated with the uterus and frequently fixed firmly in the pelvis. When the abdominal end is closed, the tube may present an enlargement increasing from the uterus outward, something like a bell-retort or gourd in shape, or resembling a sweet potato or sausage or sausage-like links.

Diagnosis. When the uterus is fixed, with extensive peritoneal inflammation on either side, it will be found, in the majority of cases, that the tubes were the source through which the infection reached the peritoneum. Normally, in a thin patient, the tubes are not palpable. Inflammatory changes, however, rendering the tubes resistant and stiffened, make them recognizable as a cord-like structure projecting from each side of the uterus. When the tubes become occluded at their abdominal ends and fill with secretion, they are more and more retort-shaped, that is, larger at the external portion and narrowing toward the uterus. A tumor of such a shape, and quite movable, is most frequently a hydrosalpinx. (Fig. 336.) At times, pus-tubes may be free from adhesions, but generally an infection so virulent as to induce pus-formation causes a perisalpingitis and an agglutination to the surrounding structures—even absolute fixation of the pelvic structures. An inflamed tube, free from adhesions, is likely to drop into Douglas' pouch. The change in its circulation frequently fixes it to the posterior surface of the uterus, the sides of the rectum, or the opposite ovary and tube, forming a large mass filling up the pelvis (Fig. 335.) Such conditions are recognized readily by bimanual palpation. It is important, however, that this should be done with great caution, as frequently the sacs are so thin, that any undue pressure causes rupture and the escape of their contents into the peritoneal cavity, starts a general infection followed by peritonitis. The association of an ovary in a mass of this kind, forming a tubo-ovarian abscess, is not recognized readily always. A tubo-ovarian cyst is determined more readily by the increase in size, and the greater spherical character of the external end of the sac, associated with a bell or retort-like shape as we approach the uterus.

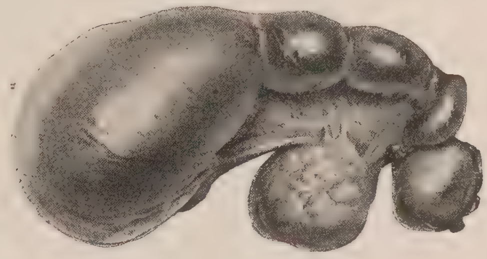


FIG. 336.—Hydrosalpinx.

Prognosis. Tubal inflammation always should be considered a source of danger. Even its mildest forms should necessitate resort to treatment, in order, if possible, to arrest the progress and limit the extension of the inflammation. When associated with pelvic peritonitis, the extensive infection, especially the streptococcic form, is one of the most dangerous lesions with which we have to deal. The cure of a patient, with diseased ovaries and extensive suppuration of the tube, in the sense of restoration of her functions, is absolutely impossible. While the patient may recover her health and comfort, she is crippled for life, because her powers of procreation are destroyed.

Treatment. (See Section 248.)

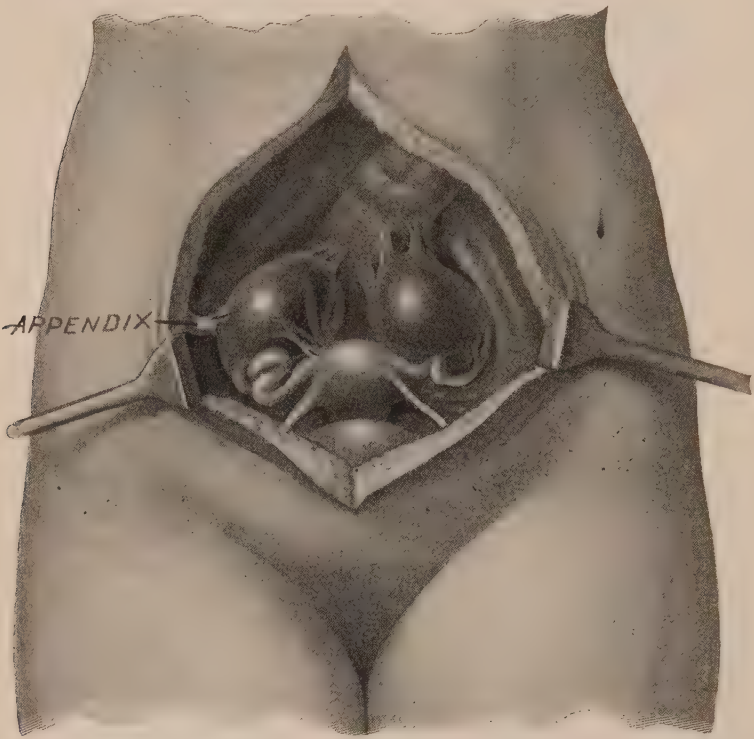


FIG. 337.—Double Pyosalpinx, Showing Adhesions to the Rectum, to the Uterus, and, on the Right, to the Appendix.

248. Inflammation of the ovary occurs in two forms: oöphoritis, involving the structure of the organ; and peri-oöphoritis, where the process is confined to the surface. A hyperemia or congestion of the ovary may arise as a result of infection. This may be so aggravated as to lead to rupture of vessels. The occurrence of hemorrhage into the structure of the ovary produces small blood-clots in the organ, known as ovarian apoplexy, or a large collection of blood, an ovarian hematoma. The hemorrhage may be so severe as to destroy the ovary and even rupture its coat, and result in a serious internal hemorrhage. Oöphoritis is an interstitial inflammation of the ovary, which may be either acute or chronic, septic or gonorrheal. It is characterized by all the signs of inflammation, hyperemia, swelling, increase in size of the vessels, extravasation of blood, and later, pus-formation. This may involve only a small portion of the ovary or the entire organ may become the seat of an abscess. The origin of the infection frequently occurs in a corpus luteum, so we have what are known as corpus luteum abscesses. In such the walls of the abscess may be recognized on microscopic section by the wavy elevations of the inner wall. The acute form of the disease is most frequently the result of infection, which gains admission through lesions of the vagina, of the uterus (subsequent to labor or abortion), surgical operations, or an accidental injury. Infection may reach the ovary through the continuous mucous membrane of the tube or by way of the lymphatics or blood-vessels. Often in fatal cases the ovary will be found very much enlarged, soft, and sloughing, and containing small extravasations of blood or pus; or, small collections of pus will be found in the connective tissue and structure of the ovary; or a single large abscess may exist, equal in size to a hen's egg or even larger. The larger abscesses may be produced by suppuration of an ovarian cyst. Suppurating ovaries generally become adherent to the neighboring structure, and, if the walls are thick, the pus may remain quiescent, thus being the cause of a chronic state of ill health. However, the pus may escape by rupturing into the bowel, bladder, or vagina. The cavity thus emptied may shrink and ultimately disappear, while a state of chronic ill health will still continue. An inflamed or cystic ovary, adherent to the inflamed tube, frequently loses the intervening wall and forms a cavity, which is known as a tubo-ovarian cyst or tubo-ovarian abscess. Coalescence of both ovaries and tubes in such a sac may result in the formation of a tumor which fills up the pelvis. The formation of an abscess in the ovary is not always associated with peri-oöphoritis. Some years ago I saw in consultation, and subsequently operated upon a patient in whom the temperature had risen to 104° F. some three weeks following delivery. Careful examination failed to reveal any increase in size of the uterus or anything to indicate that the uterus was the seat of disease. Some enlargement of the ovary upon the left side, which, however, was free from adhesions, led me to open the abdomen. The left ovary was the size of a small orange. It was found to be free from any adhesions, but there was a small flake of lymph on one side which corresponded with similar material in the orifice of the tube. The tube itself was not enlarged nor did it show any signs of an inflammatory condition. The ovary was afterward removed and, when opened, contained within a thin shell some thick, greenish pus. The subsequent convalescence of the patient was uninterrupted.

In chronic oöphoritis the connective tissue is greatly increased, causing contraction, destruction of the follicles and compression and arrest of development of the stroma, while the epithelium of the free surface is the longest preserved. The latter may present extensive fissures, as a result of the contraction. In chronic inflammation the tunica albuginea becomes so greatly thickened, that it does not readily rupture with the development of the Graafian follicle. Consequently the follicle increases in size, and the ovary presents a large number of cysts, producing the condition known as cystic degeneration of the ovary. Oöphoritis serosa is another form of chronic inflammation of the ovary. In this the inflammation is chronic in development and duration, and in the majority of cases curable if properly treated. It may be a sequel of fevers, sometimes is associated with mumps, and may follow a passive gonorrheal infection. The ovaries become swollen, exceedingly tender, and frequently prolapsed. When the disease is of long duration the ovaries are greatly swollen, quite smooth, shiny, and almost translucent. Folds and cicatrices are obliterated completely. Various changes in the ovaries are said to be due to cirrhosis. I have frequently seen ovaries which were pronounced cirrhotic, but which I could not regard otherwise than as physiologic. The term is only applicable to cases in which the ovary has undergone contraction to such a degree as to result in the destruction of its glandular tissue and decided decrease in size of the organs.

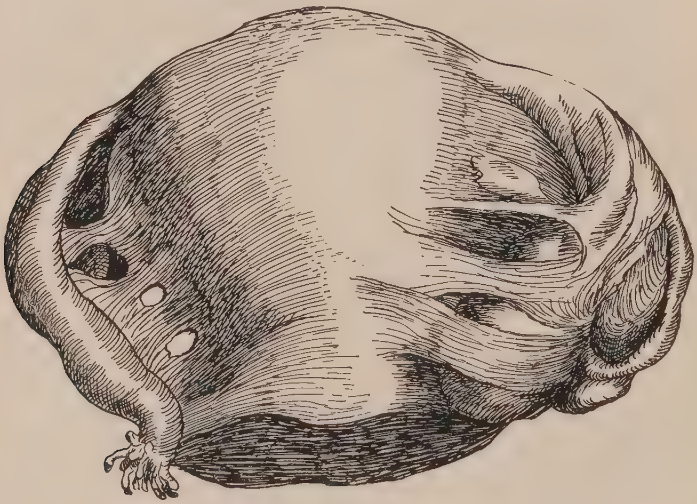


FIG. 338.—Peri-oöphoritis. Tube and Ovary Encysted.

Peri-oöphoritis is a condition characterized by the deposition of inflammatory material upon the surface of the ovary. The surface epithelium is destroyed and is likely to be followed by true oöphoritis. Peri-oöphoritis, like simple oöphoritis, is frequently a part of a widely extended inflammatory process, which may involve uterus, oviducts, ovaries, pelvic peritoneum, and cellular tissue. (Fig. 338.) Generally it results from an extension of infection from the tubal orifice to the pelvic peritoneum, although it may follow an abscess of the ovary. Usually the end of the tube is adherent to the ovary in this form of inflammation, and it may be the forerunner of a tubo-ovarian abscess. The inflammation varies from a few bands of adhesions which bind down the ovary and tubal orifice, possibly occluding the latter, to a mass of exudation which completely obscures both and forms so intimate a fusion as to render difficult the line of demarcation between these organs.

The chief function of the ovary, apart from any supposed internal secretion, is to provide a site for the perfect development and maintenance of healthy ova, and to permit them, under circumstances as yet undetermined, to pass into the mouth of the oviduct. Peri-oöphoritis necessarily interferes with this process, by the presence of adhesions about the ovary or the consequent induration of its tunic. An ovum escaping from a matured Graafian follicle will be barred from entrance into the oviduct by adhesions which fix the fimbriated orifice or envelop the ovary. Such adhesions are a cause of severe suffering, especially when they limit the free mobility of the ovary and fix it subject to pressure, behind the uterus, over the rectum, or where intestinal adhesions subject it to constant dragging and tension by intestinal peristalsis. An ovary fixed in the retro-uterine pouch, with an overlying retroverted uterus, is a continual source of distress. Its position, independent of the adhesions, causes congestion from the obstructed circulation, while the pressure of feces or the impinging organ of the male during coition augments the discomfort.

Symptoms. Oöphoritis exhibits no characteristic symptoms. Even in cases of acute septic poisoning nothing will be present which can be said to be an absolute indication of ovarian lesion. In the less severe form of inflammation we may recognize symptoms which we could justly attribute to ovarian disease, but they are so intimately associated with those caused by disease of the oviducts that differentiation becomes difficult. Pain is the only persistent symptom in all varieties of pelvic inflammation, and the site to which it is referred bears no constant relation to the affected organ. Though the entire pelvic region may be the seat of pain, we are unable definitely to distinguish the exact origin of pain and say whether it is due to affections of the tube, ovary, peritoneum, broad ligament, body of the uterus, cervix, or independent of disorder in any of them. This can be appreciated readily when it is remembered that the nervous distribution of the various organs is derived from a common sympathetic center. As in every inflammatory condition, pain is aggravated by pressure, so in such processes of pelvic structures pain is magnified by pressure and motion. The pain is distinguished from that of true dysmenorrhea by the fact that it is an exaggeration of the distress and is felt between the periods, while dysmenorrhea is purely a menstrual pain. Not infrequently patients will assure us that the only time they are free from discomfort is during the menstrual flow. Pain may persist subsequent to coition as a result of congestive tension. When produced by intra-abdominal pressure and increased by standing, pain is greatly relieved by assuming the recumbent position. Ovarian pain is directly aggravated by pressure over the organs through the vagina or rectum, as during coitus, an examination, or the passage of large fecal masses. Such symptoms of pelvic disease, as amenorrhea, menorrhagia, or leukorrhea, are not characteristic of oöphoritis. Peri-oöphoritis causes pain which is more or less distinctly localized at the pelvic brim, and extends down the corresponding thigh. Not infrequently pain is experienced in the breast on the same side. The inflammation may extend from the surface of the ovary into its substance and cause changes in its stroma, dropsy of its follicles, or hemorrhage, resulting in cystic degeneration, in one case, and in the other, in hematoma or apoplexy of the ovary. The wide distribution of neurotic symptoms must not be overlooked. The local pelvic lesion may be a minor one. To oöphoritis or uterine displacement are often attributed symptoms which are the result of fissures of the cervix, mobility of the kidney, enteroptosis, gastroptosis, or even central lesions of the nervous system, which will persist after the supposed local lesion has been cured or removed. Such experiences are a source of great disappointment to the gynecologist, as sometimes relief is obtained, and at others pain and distress continue or are even aggravated.

Diagnosis. Inflammatory processes of the ovary present no constant characteristic clinical picture. Infection rarely confines itself to the ovary, consequently the symptomatic phenomena are modified by the circumjacent inflammatory changes. The recognition by vaginal or rectal palpation of a tender body, somewhat enlarged, which still retains the shape of the ovary, adds certainty to the diagnosis. The presence of adhesions or exudate will render its determination difficult and make it doubtful how much the swelling is due to the ovary, the tube, or the exudate. In acute conditions or in hyperesthetic patients an anesthetic will prove of value. Where the obscurity of the condition cannot be overcome, a preliminary vaginal or abdominal incision may be necessary in order to determine the proper operative procedure.

Treatment of Inflammation of the Appendages. In the great majority of chronic inflammations of the uterine appendages the affection of the ovaries and tubes is so closely related that I deem it better to consider their treatment under one section. The first aim in the treatment is the preservation of function in the affected organs. The second, the restoration of health to the patient. Treatment may be either medical or surgical. The medical or nonoperative treatment consists in rest in bed and in keeping the patient absolutely quiet. Free purgation with salines should be established in order to make the intestines drain the peritoneal cavity and relieve the congestion. The diet should be restricted and cold should be applied to the external surface. In the acute stage the ice-bag is of value, and this should be kept more or less continuously applied. It decreases the congestion, limits the exudation, lessens the danger of suppuration, and promotes absorption. After the more acute symptoms have subsided the treatment still further may be promoted by pressure, using three to five pounds of shot in a bag. This is applied over the inflamed, indurated tissues. The pressure is increased and its position changed as may be demanded. Probably, unless suppuration has occurred, resolution will be accomplished. Absorption may be promoted still further by such counter-irritants as small blisters, painting with iodin, croton oil, or inunctions of dilute ointment of the mercuric iodid (a dram of the official ointment to an ounce of lanolin). Occasionally ice will cause discomfort and heat be more grateful to the patient. A flaxseed poultice, or more agreeable and more easily applied, is a piece of spongio-pilin, wrung out of hot water, placed over the abdomen and covered with a dry cloth. A hot water bottle over this removes the necessity of changing the dressing frequently.

One or two drams of ichthyol to the ounce of lanolin may be rubbed on the lower part of the abdomen in addition to the pressure suggested.

Hot vaginal douches should be given, and rectal enemas of a pint to a quart of hot water, retained as long as possible, will be beneficial. These are more effective than hot vaginal douches as the heat comes into nearer contact with the inflamed surfaces, and can be retained longer. Internal medication should be largely supporting. The patient should be protected carefully from exposure or over-fatigue. During menstruation, she should be confined to her bed. After the more acute stages have subsided, besides douches and enemas, she may take a hot sitz bath for fifteen to thirty minutes daily. If acute symptoms and suppuration do not occur, the adherent ovaries and tubes may be set free by pelvic massage. The structures are lifted up with one or two fingers within the vagina and manipulation over the abdomen is employed, gradually pressing in the fingers, following the lines of cleavage and lengthening the bands of adhesions to promote their absorption by stretching and irritation. The congestion and pain in chronic inflammation of the ovary frequently may be greatly lessened by the administration of fluidextract of gelsemium in five drop doses three times daily. Great prudence must be exercised in the administration of anodynes. Patients may easily acquire the morphin or opium habit, and the drug, instead of being a servant attains the position of master, and the patient is enslaved to a drug from which emancipation is exceedingly difficult. While, in an acute attack, a dose of morphin may be necessary to allay violent pain, in the majority of cases the early and continuous administration of the salines with the application of the ice-bag will be effective in arresting severe pain, or, at least, making it endurable. The measures which we have already discussed are in the line I have denominated the first aim in the treatment of lesions of the uterine organs—that is, to retain and maintain the functions of the organ.

Surgical measures do not necessarily exclude this first aim, but on the contrary, may assure its accomplishment when established early and efficiently. Delay will often favor the development of conditions which necessitate more serious procedures. Operative treatment with a view to maintenance or restoration of function is known as conservative treatment. Where the sacrifice of the appendages is considered necessary, in order to save life or ensure good health, the procedure is known as a radical one. Conservative treatment may consist in breaking up adhesions; reopening the orifice of the tube; salpingostomy; or partial resection of the tube itself, thus shortening it and permitting the removal of such portions as are prejudicial to health. (Figs. 339 and 340.) Conservation includes also the resection and removal of diseased portions of the ovary, with the endeavor to retain a sufficient portion of it, to insure the continuance of ovulation and menstruation. In chronic oöphoritis, marked by thickening of the tunica albuginea and development of small cysts in the ovary, a resection or removal of the more diseased portion will frequently result in such metabolism as to restore the remainder to a more normal state. Wherever conditions will permit the retention of a portion of ovary the continuation of menstruation and ovulation have a marked influence on the general morale and nervous condition of the patient.

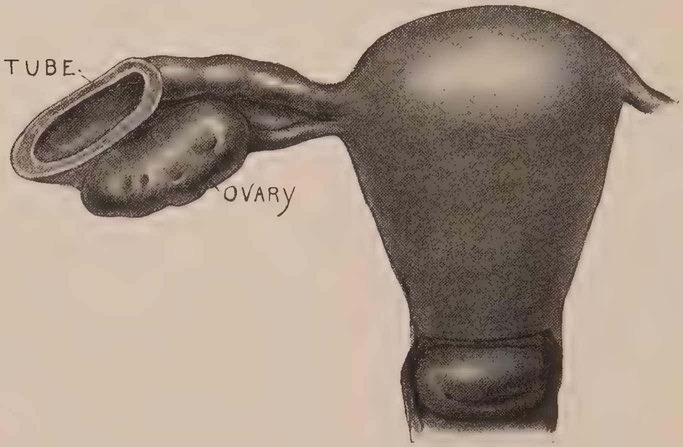


FIG. 339.—Resection of Tube.

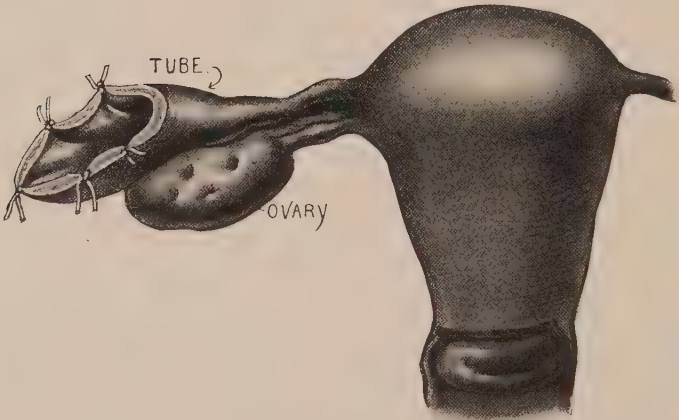


FIG. 340.—Operation of Resection of Tube Completed.

The retention of the whole or part of an ovary is desirable even when it is necessary to remove both tubes, because it insures the continuation of ovulation and menstruation. The surgeon must be governed by the physical condition of the organs under his consideration. The abdomen should remain unopened unless palpable disease of the uterine appendages can be determined. Operations for pain without ovarian enlargement, will be attended with no favorable result. Where the disease is extensive and ovaries and tubes have undergone destruction, the removal of these organs oftentimes will be the only procedure to afford any hope for restoration of the comfort and health of the patient. In suppurative conditions where the ovary also is involved in the inflammatory process the better plan of procedure will be the complete removal of the ovary and tube. In one of my patients the left ovary and tube were so extensively involved that their removal was indicated. The right tube was considerably enlarged. Its wall, several times its ordinary thickness, contained pus. The left tube and ovary having been removed, the right tube was dissected from the cornua of the uterus and the opening in the broad ligament closed with a continuous catgut suture, thus controlling hemorrhage. The ovary, presenting no marked change, was permitted to remain. Such operations are exceedingly difficult sometimes, as on opening the abdomen the tube and ovary, with the fundus of the uterus are fixed in the pelvis in close association with coils of intestine, omentum, and the parietal peritoneum. Where sepsis is recent, it is often necessary to consider the advisability of removing the uterus as well as the appendages. When the abdomen is opened, every structure should be inspected carefully and examined by touch. Adhesions should be separated and proper care exercised to insure control of hemorrhage. Occasionally the broad ligament will be so contracted from inflammatory changes that it will be impossible to lift the structures out of the wound, when the broad ligament should be resected with the ovary and tube. Ligation may be avoided by seizing the bleeding vessels with hemostatic forceps, after which the wound in the broad ligament can be closed with a continuous catgut suture so introduced that each turn or second turn shall lock the preceding stitch and thus ensure against hemorrhage and prevent undue distortion of the broad ligament. After the more critical operations, and sometimes prior to them, the patient may be greatly benefitted by the rest treatment introduced by S. Weir Mitchell. It consists in the isolation of the patient, careful study of her condition, and the improvement of her general nutrition. The patient should be kept absolutely in bed; her secretions made normal and her diet restricted, possibly at first to milk. Later, feeding should be forced. Graduated exercise should be advised, supplemented by the employment of massage and electricity. By these means the elements of the blood are restored and the patient gradually regains her strength and health.

249. Pelvic inflammation is a comprehensive term. It is necessary, at the outset, to limit it to the conditions which we intend it shall include. Inflammation of the individual pelvic viscera has been discussed, so this term will be confined to inflammation which involves the cellular tissue and the peritoneum. It consequently includes those affections described as pelvic cellulitis and pelvic peritonitis.

These conditions have been designated as peri-uterine inflammation; by some writers of distinction, notably Virchow and Matthews-Duncan, the terms parametritis and perimetritis have been used—the former to indicate inflammation of the cellular tissue; the latter, of the peritoneum. These terms are objectionable for the following reasons: First, they are so nearly alike in sound that it is difficult for the student to avoid confusion in their use, and the subject is rendered more difficult of comprehension. Second, a difference which does not exist in the anatomic relations of the peritoneum and cellular tissue to the uterus is implied. The pelvic connective tissue and the pelvic peritoneum are in equally close contact with the uterus. It is distinctly objectionable, therefore, to consider one as an inflammation around the uterus and the other as an inflammation near it. Third, the conditions are described as associated with the uterus, while they may exist in all the tissues of the pelvis, and are not necessarily uterine in their origin.

Careful investigation of the pathology of these conditions by autopsy, and extended study during abdominal procedures in active stages of disease, show how easily such erroneous views could arise.

Bernutz and Aran, of France, many years ago demonstrated the true nature of pelvic inflammation. The practice of abdominal surgery has abundantly confirmed their theory by affording opportunity for comparing physical signs with actual pathologic changes.

Varieties. Pelvic inflammation, as we have described it, is properly divided into inflammation of the cellular tissue (*pelvic cellulitis*) and inflammation of the peritoneum (*pelvic peritonitis*). It must not be understood in these definitions that the demarcation is sharply defined, for, in practice, inflammation is not confined to a single or specific structure. They indicate simply that the inflammation predominates in the structure named.

250. Pelvic cellulitis, parametritis, or peri-uterine phlegmon is an inflammation of the pelvic cellular tissue. It may be either primary or secondary: *i. e.*, it may have originated in the cellular tissue or may have reached it by extension from the neighboring structures. The primary inflammation is an acute infective disease which differs in no respect from acute inflammation of the connective tissue in any other portion of the body. Chronic pelvic cellulitis is always a secondary affection, and may or may not have been preceded by an acute attack. The pelvic connective tissue is not a special structure, but a portion of that wide system of mesoblastic connective tissue which surrounds the great vessels of the trunk and accompanies their branches from origin to termination. This connective tissue is found in the pelvis, partly in the form of a loose areolar network, partly in the more condensed form of fascia. It surrounds all the blood-vessels, nerves, and lymphatics, as well as the uterus, and serves as investing sheaths for them outside the pelvic cavity. It is closed off from the perineum and ischiorectal fossa by the pelvic fascia, a strong aponeurosis, which is attached to the pelvic wall between the pubic bones and bodies of the ischia, and along that thickening of the obturator fascia known as the white line. The fascia passes as a continuous layer over the levator ani and coccygeus muscles to the vagina in front, and to the rectum and coccyx behind. It blends closely with the vaginal orifice, behind the pubic symphysis, as the triangular ligament. Inflammatory exudations of the female genital organs above the vulva are situated above this strong fascia. The exudate with such a boundary below has the peritoneum for its superior limitation. This boundary, however, is less abrupt, as its connective tissue layer is continuous with the subserous connective tissue of the parietal peritoneum of the abdomen. With the exception of the fundus of the uterus, it forms a layer beneath the entire pelvic peritoneum—both parietal and visceral. The so-called uterine ligaments contain more or less connective tissue between their peritoneal folds, and in certain situations it is abundant; for instance, around the supravaginal portion of the cervix, and along the base of the broad ligaments and between the bladder and symphysis pubis. In the latter situation it contains a varying quantity of fat in its meshes.

The office of this tissue in the pelvis, as elsewhere, is to protect and support the other structures, performing a passive mechanical function. It affords a cushion which prevents injury of the viscera (Schaefer). The connective-tissue layer, between the vagina and peritoneum posterior to the uterus, generally does not measure more than 1/3 of an inch in thickness, but in pregnancy its thickness is greatly increased. During the progress of development of a pregnant uterus the broad ligaments are gradually drawn upward, until at the completion of the pregnancy they lie in the iliac fossa, above the brim of the pelvis, while no peritoneum dips into the lateral parts of the pelvis. The space thus vacated is filled with connective tissue, which is enormously increased during the later months of pregnancy. Freund describes a form of cellulitis which affects more particularly the fatless connective tissue, or fascia, which he calls parametritis chronica atrophicans circumscriptum et diffusum. Cellulitis is a very common complication of pelvic peritonitis, involving particularly the uterosacral ligaments and peritoneal folds. Schultze calls this parametritis posterior: uterosacral cellulitis is more accurate. Cicatrization of the ligaments following such inflammation causes traction upon the upper part of the cervix, and is a very common cause of dysmenorrhea and sterility. As a result of the contraction of the tissues the uterus may be anteflexed and drawn to one side or backward, thus producing a pathologic anteflexion. By compression of the vessels and nerves the uterus and ovaries may become atrophied. Cellulitis may exist with or without suppuration. When suppuration does not occur, an exudation results in the connective tissue, which becomes edematous, and subsequently more or less organized, firm, and hard, causing pressure upon the vessels and nerves which pass through it. The changes in this structure are similar to those which take place in cirrhosis of the liver or kidney.

Etiology. Primary pelvic cellulitis is always a result of sepsis. Ready entrance for septic material is afforded through lacerations of the cervix uteri. These injuries may be caused by the use of forceps, and, if kept aseptic, heal readily. In the nullipara, cellulitis may arise from the same causes as pelvic peritonitis (such as exposure to cold during menstruation) being then generally associated with pelvic peritonitis; and from surgical operations which open the connective tissue (as in the removal of large uterine polypi) and afford an opportunity for cellulitic infection. The danger is especially great when the growths are expelled or removed while in a state of necrosis. There is a certain amount of lymphangitis then, with which the lymphatic glands may be implicated. Cellulitis may develop from disease in the bladder. As a result of such irritation the connective tissue outside the bladder thickens. This thickening passes outward and forward, and, in ultimate atrophy, may cause uterine displacement in the opposite direction. From the rectum, the causative irritation may be dysenteric. A pelvic cellulitic abscess is frequently so situated as to render it more than probable that the hypogastric glands are involved. Inflammation occurs more rarely in the cellular tissue than in the pelvic peritoneum. With the advent of suppuration an abscess follows, generally of large dimensions, although occasionally, several abscesses may be found in close apposition.

Symptoms. In puerperal cases the cellulitis is generally ushered in with a rigor or chill about the second or third day after delivery, although occasionally it may occur later. In nonpuerperal cases the interval between infection and the first manifestation of symptoms is rarely more than one or two days. The occurrence of the chill has produced the belief that the inflammation arises from exposure to cold; simultaneously with the chill occurs an elevation of temperature, a rapid pulse, but rarely pain, unless the peritoneum is involved. When suppuration occurs, the most marked symptom is the progressive emaciation associated with pallor or earthy sallowness of the skin. The skin is harsh, dry, and covered with bran-like scales from the fine desquamation. Peritonitis may complicate the condition and will be indicated by the frequent vomiting of a dark-green fluid. Vomiting will be excited by the ingestion of the smallest quantity of anything, even liquids. The patient looks ill, loses her appetite, and suffers from marked debility and severe mental depression. She becomes very irritable. If the exudation extends to the fascia, over the iliacus and psoas muscles, and particularly if the connective-tissue elements between these muscles are involved, the patient will lie upon her back with the leg of the affected side flexed and the thigh bent upon the trunk. The symptoms are those of a subacute form of septicemia. Pain and local signs may be so slightly marked as to lead the condition to be unsuspected or overlooked.

Physical Signs. In the early stages of an acute attack the physical signs are but slightly marked. All that will be noticed by digital examination is that the vagina is hot and its vessels are pulsating. In a few hours there are indications of an inflammatory exudate. There is a doughy sensation and fullness on one side of the uterus and in the iliac fossa. This may extend partly around the cervix, and subsequently become hard and indurated. If the poison has entered through a wound in the cervix, the latter becomes less movable. The supravaginal tissues on the affected side are tender, more or less hard, and unyielding. There is a bulging at the side of the uterus, and the lateral fornix on that side is apparently obliterated. (Fig. 341.) We rarely find both sides of the uterus affected at the same time, but occasionally the whole supravaginal portion of the cervix may be embedded in a thick collar of indurated tissue, which more or less completely surrounds it. Generally the disease spreads laterally along the base of the broad ligament to the tissue beneath the reflection of the peritoneum on the anterior abdominal wall. When this occurs, a uniform hardness or resistance is felt in the abdominal wall beneath the muscles. This may assume the form of a broad band, half an inch to 2 inches or more in width, lying along the upper border of Poupart's ligament. Occasionally the exudation spreads upward and outward from above Poupart's ligament into the iliac fossa. This exudation may extend in one of two ways: (*a*) Either by following the course of the lymphatics which run from the uterus outward beneath and between the layers of the broad ligament to the glands and lumbar region; (*b*) or

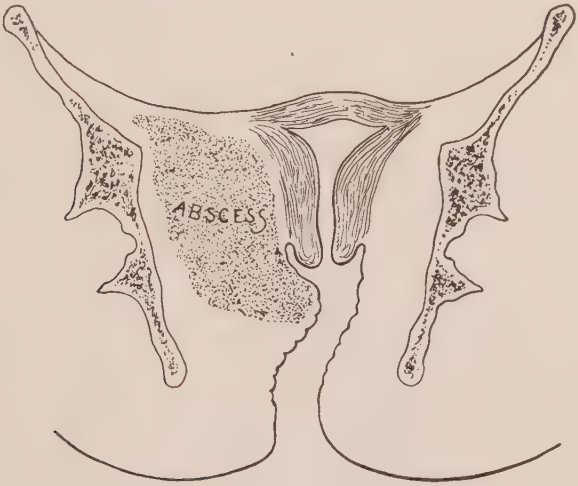


FIG. 341.—Exudation in Broad Ligament from Pelvic Cellulitis.

by lines of cleavage in the cellular tissue of the pelvis. In the latter it frequently passes backward, producing an exudation about one or both uterosacral ligaments in the tissue enveloping the rectum, and lines the posterior pelvic wall beneath the peritoneum. The rectum will be felt wholly or partly surrounded by a belt of exudation, which forms a bridge or an arch. If suppuration does not occur, the exudation becomes absorbed, and, in uncomplicated cases, the hardness may so far disappear as to leave no subsequent trace. In not a few cases pelvic cellulitis results in the formation of an abscess. The situation of the abscess and the direction in which it may be expected to extend depend upon the situation and the extent of the inflammatory exudation. If seated in the base of the broad ligament and passing forward beneath the peritoneum, to the anterior abdominal wall, an area of induration may be noticed above Poupart's ligament. Suppuration is indicated by the occurrence, over the indurated area, of edema in the skin, which pits on pressure;

by deep-seated fluctuation, especially under bimanual examination; and by the eventual pointing of the abscess a little above Poupart's ligament. Often the pus can be detected before it reaches the surface by passing the tip of the finger carefully over the induration, when a softened point will be recognized in the surrounding hardness. Unfortunately as we have already noticed, pelvic cellulitis may extend backward instead of forward, when, if suppuration follows, an abscess forms beneath the peritoneum covering the back of the pelvis. Such an abscess has no direct access to the free surface, relief is much longer delayed, and extensive burrowing follows which can extend into the iliac fossa and the loin, particularly when it is seated in the posterior wall. The abscess may point at the iliac crest, or may sometimes leave the pelvis by the sciatic notch and follow the course of the sciatic or gluteal vessels. Again, it appears in Scarpa's triangle, having followed the side of the femoral vessels. By whatever route the abscess leaves the pelvis it will follow the prolongation of the connective tissue upon the blood-vessels or the ureter, rather than that of the nerves or tendons. When pus burrows along the psoas muscle, it comes, not from cellulitic abscess, but from dead bone, and this is an important fact to keep in mind.

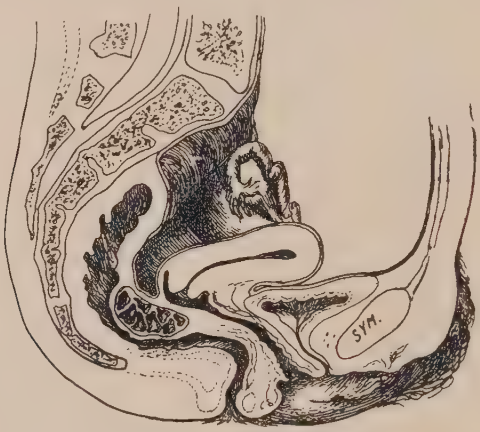


FIG. 342.—Exudation of Cellulitis over Rectum.

I saw with the late Dr. Kappes a patient who had been confined about six weeks previously. She was suffering from what appeared to be a subacute attack of septicemia. She was lying with her limbs drawn up, and complained of severe pain in the abdomen, extending into the groin. On examination, induration could be recognized extending from the left lumbar region to the groin. Vaginal examination disclosed the uterus freely movable, with no induration about it nor in the pelvis, until the finger was passed well above the brim, when the indurated psoas muscle was recognized. On inquiry this patient gave a history of having fallen in a sitting position, during the third month of pregnancy, while walking on stilts to amuse her children. She suffered more or less discomfort during the remainder of the pregnancy. An incision was made on the left side over the crest of the ilium and the peritoneum was pushed forward, when the tissue of the psoas muscle was found infiltrated with purulent material. It was hoped that the vent thus afforded would give the patient relief. She improved for a few days, when pain occurred upon the opposite side, where a similar condition was found.

We not infrequently hear of cellulitic abscesses opening into the rectum, vagina, or bladder, but these cases are doubtful, when considered in the light of the pathology of pelvic inflammation. They are more than likely cases of intra-peritoneal suppuration which have originated either in disease of the Fallopian tubes or of the ovaries. An abscess will usually point between the seventh and twelfth weeks.

In discussing pelvic disease we should not overlook a peculiarly malignant form of inflammation, mostly occurring in puerperal women. In this multiple abscesses in the connective tissue are found associated with other lesions significant of the virulence of the infection. Many of these abscesses are so small as easily to elude detection. The condition is known as diffuse pelvic suppuration, and has all the characteristics of phlegmonous erysipelas. The tissues become edematous and of a livid hue. Suppurating thrombi are found in the veins and the lymphatics are acutely inflamed. Occasionally, the ovaries may be found in a state of suppuration. Associated with this condition are all the symptoms of acute infection in its most virulent form.

Diagnosis. The absence of pain frequently permits considerable progress before the existence of the condition is suspected. Puerperal women, because of the tenderness of the external genitals and the presence of the lochial discharge, are very averse to vaginal examination. If the puerperium pursues a normal course, this aversion should be respected, but it cannot be too strongly asserted that examination should be made whenever symptoms of pyrexia supervene and the ordinary course of convalescence is interrupted. A temporary disturbance of temperature and of pulse-rate may result from such causes as constipation, excitement, and mammary engorgement. Unless such conditions can be recognized as provocative of the disturbance, if the abnormal symptoms are persistent, or especially if the lochia is offensive, a thorough examination not only of the vagina, but of the interior of the uterus, is required. During the first ten days subsequent to delivery the uterus can be explored readily without artificial dilatation. If a portion of placental tissue or a decomposing blood-clot is found, it should be removed, and the uterine cavity should be cleansed and disinfected. Ordinarily the symptoms will be relieved promptly. If they are not, the examination will have revealed the probable cause of the disorder, and simultaneously will permit any swelling or other morbid condition of the pelvic tissues to be detected. A few days after the onset of the attack the physical signs of cellulitis will be so marked as to render the diagnosis certain, and a laceration of the cervix or of the vagina will be disclosed as the probable gateway for the entrance of the infection. Occasionally the first indication of cellulitis will be an impaired mobility of the cervix upon one side, on which tenderness and swelling will be marked. Later, this inflamed structure becomes stiff, and passes to well-defined hardness. The cellulitis may be situated to one side of the cervix or may extend along the base of the broad ligament of the affected side. The lateral fornix of the vagina will be completely obliterated. When the inflammation extends backward, vaginal examinations of the posterior wall will reveal a diffuse fullness and hardness on the affected side, which is still further demonstrated by rectal examination. In the rare cases in which the broad ligament itself is affected the diagnosis is determined by finding the mobility of the body of the uterus impaired, and a more or less flattened mass of induration upon one side, which is continuous with the uterus. Excepting the plane of tissue between the cervix uteri and the bladder, the cellular area of one side of the pelvis is practically shut off from that of the other. Hence, we find pelvic cellulitis is, for the most part, unilateral. The differential diagnosis of pelvic peritonitis will be discussed later.

The only other conditions with which cellulitis can be confounded are hematoma of the broad ligament and myoma of the uterus. In hematoma there is an effusion of blood into the connective tissue. This forms a slightly movable, somewhat flattened tumor alongside of and continuous with the uterus. The history of the case and the absence of symptoms of severe illness will generally serve to distinguish it. It occurs suddenly, from rupture of a pregnant tube or of a varicose vein in the broad ligament. In either case the onset is marked by violent pain, faintness, syncope, and usually vomiting. In pregnancy of the tube one or two menstrual periods will have been passed, and the pain will be situated in the lower part of the abdomen (generally on one side) with irregular uterine bleeding. The effect of such an outpouring of blood upon the temperature and pulse is transient. The temperature is not elevated. If infection occurs, suppuration results, and the symptoms then are similar to those of pelvic abscess from cellulitis. Myoma can rarely be mistaken for cellulitis. Error is possible only in those rare cases in which the myoma develops laterally between the layers of the broad ligament and forms a more or less hard tumor directly continuous with it. Should the myoma be complicated by a localized peritonitis, or the tumor become inflamed or gangrenous, diagnosis may be difficult. In the posterior wall error is scarcely probable, for large inflammatory exudations into the connective tissue behind the uterus are extremely rare. In the anterior wall the signs of cellulitic exudation between the bladder and the upper part of the cervix are well marked and characteristic.

Prognosis. The disease terminates in recovery, except in the diffuse variety, when it is a part of a general septic process. With subsidence of fever the exudation is gradually absorbed, and under favorable circumstances entirely disappears in a few weeks. Cellulitis uncomplicated by peritonitis leaves no unpleasant results, no adhesions nor displacements. Consequently, its existence is no bar to subsequent pregnancy. If fever continues longer than five or six weeks, suppuration has probably resulted. The duration and progress of the illness will largely depend upon the direction the pus takes. Generally it points above Poupart's ligament, where it can be easily and satisfactorily opened. Such cases invariably do well. In the rare cases when it occurs at the back of the pelvis, pus is longer in reaching the surface, and may burrow in different directions. Such cases often last a long time, and are likely to be complicated by extension to the peritoneum. When resolution and the absorption of the inflammatory processes are slow, the exudate will become organized, and cause cicatricial contraction and resulting displacement of the uterus. Such contractions also lead to atrophy of the uterus and ovaries. The obstruction of the circulation produces localized congestion and even inflammation, and causes disturbances of menstruation, such as menorrhagia, dysmenorrhea, and sterility. It is necessary, then, to be guarded in our promises of complete recovery.

Treatment. A description of the disease and its causes emphasizes the importance of preventive treatment. This consists in careful attention to the principles of asepsis or surgical cleanliness in all midwifery cases and in surgical manipulations. If freedom from infection could be insured, pelvic cellulitis would disappear. When the disease is once developed, medication, either internal or external, has but little influence. The most important indication is to avoid doing the patient harm. Particular care should be exercised in the administration of opium and antipyretics. The former agent is generally given as a matter of routine. Opium adds to the disturbance of the already obstructed digestive functions and aggravates constipation—one of the difficulties which it is important to obviate. Opium or morphin should be given only in cases complicated by peritonitis, in which it is absolutely necessary to afford relief. Similarly, antipyretics should be reserved for the rare occasions when the temperature is so high as to constitute a source of danger in itself. A simple saline mixture, potassium citrate, or small, frequently repeated doses of magnesium sulphate should be given until the bowels are freely evacuated. Care should be exercised to avoid fecal accumulation. The question of feeding is of equal importance: farinaceous diet in the acute stages, with meat, eggs, and easily digested food in the later period of the disease. The tendency to emaciation calls for generous feeding. In the early stages of the inflammation an ice-bag over the abdomen will limit the congestion and the amount of inflammatory exudate. When the ice-bag is uncomfortable or causes distress, hot fomentations should be applied. Hot vaginal douches, at a temperature of from 110° F. to 115° F., are advocated by Emmet, although the influence they exert is doubtful. When pus forms, the case should be dealt with according to recognized surgical principles. The abscess should be opened as soon as fluctuation is detected or there is the faintest indication of pointing, and drainage should be instituted for a few days. If the abscess points in the vagina, it must be opened there. Most of the fluctuating swellings felt through the vaginal roof are not cellulitic abscesses, but come from an entirely different direction. While not generally recognized as the proper plan of treatment, yet, without question, the course of an abscess can be shortened or suppuration prevented by making an incision in the infected cellular tissue through the vagina as soon as the swelling about the uterus can be recognized. The infected area should be broken into with the finger, and a gauze drain inserted to afford vent for the discharge. The drainage thus secured will frequently obviate the occurrence and danger of suppuration and prevent the extension of inflammation to the pelvic peritoneum. If the patient lies with the thigh flexed on the body, the limb should be exercised by lifting the foot with the hand under the heel two or three times a day sufficiently to straighten the knee. This will prevent permanent contraction and stiffening of the joint.

Chronic pelvic cellulitis, as already asserted, does not exist as an independent affection. Not infrequently it follows purulent salpingitis or other intrapelvic suppurative inflammation, and involves only the parts immediately contiguous to the inflamed structures. The induration which it causes, introduces for a time, an element of obscurity in the diagnosis of deep-seated inflammatory lesions of the pelvis. It is rarely attended with cellulitic abscess, and is characterized chiefly by edema and small-cell infiltration of the connective tissue. Its absorption and the mobility of the uterus may be promoted by the practice of pelvic massage. (Section 105.) When cellulitis has existed sufficiently long to result in atrophy of the uterus or ovary, treatment exerts but little effect.

251. **Pelvic peritonitis, perimetritis, perisalpingitis,** or **perioöphoritis,** is an inflammation of the peritoneum situated within the pelvis. It occurs more frequently than pelvic cellulitis; indeed, more frequently than any other form of inflammatory disease within the pelvis. In the great majority of cases it is an infective process, due either to the presence of micro-organisms or to the effect of their chemic products. In the main its action may be regarded as beneficial, as it is one of nature's efforts to resist or to do battle with the invading foe by erecting barriers around the diseased area. These barriers serve to narrow or to confine the field of invasion, and shield the neighboring structures from damage. Treves asserts that the purpose of peritonitis is to save and not to destroy life. Unfortunately, the poison may be virulent, exist in so large a quantity, or the resistive powers of the patient be so enfeebled that we are neither able to limit nor to guide the inflammatory process to a successful issue.

Etiology. Probably pelvic peritonitis never occurs as a primary disease, but always as a complication of a preëxisting disorder. Occasionally, however, it is the first recognized expression of such disease. The symptoms of peritonitis are so severe that attention is at once aroused, while the condition from which it originated may have been so insidious as to have been overlooked. From want of knowledge, then, of the previous disease we are often compelled to ignore the exciting condition, and to say that the patient suffers from pelvic peritonitis. Is it surprising that the original condition was formerly unrecognized and the disease denominated idiopathic peritonitis supposed to result from a slight injury or from exposure to cold? It is true there are still cases in which we are unable to discover the preëxisting disease, but such have become less and less frequent. Now failure to determine the cause of pelvic peritonitis is the result of defective observation and of want of knowledge.

The most frequent cause is sepsis; next, gonorrheal infection. The micro-organisms principally concerned in the development of infection are the streptococcus, the staphylococcus, the gonococcus, the bacillus coli communis, and the bacillus tuberculosis. The propagation of these infectious micro-organisms is favored by parturition, abortion, instrumental examination, and surgical interference. Other causes are inflammations of the appendix, intestinal perforations, abdominal lesions, rupture of an ectopic gestation, hematocele, ovarian abscess or hematoma, and malignant disease.

Infection generally reaches the peritoneum in one of three ways: first, by the continuous mucous membrane through the uterine cavity and tubes; second, by the blood-vessels; third, by the lymphatics.

Tubal disease is the most common cause of pelvic peritonitis, and should receive first consideration. The mucous membrane of the Fallopian tube is continuous with that of the uterus, and at its abdominal end opens into the peritoneal cavity.

The continuity of the tubal mucous membrane with that of the uterus and vagina subjects it to continual danger of infection. The tendency of every acute infective endometritis, whether septic, gonorrheal, or tubercular, is to extend to and involve the tube. The relation of the tubal mucous membrane to the peritoneum, in infection of the former, favors its extension to the latter. This risk is further aggravated by the anatomic position of the tube in woman. No other mucous membrane is similarly situated. The uterine cavity, when inflamed, naturally drains into the vagina through the external os; but the tube has its most constricted portion toward the uterus, where the lumen of the canal is but large enough to permit the passage of a bristle. A slight amount of swelling will be sufficient to close the uterine end, when the only other outlet of the tube is into the peritoneum. The absence of a suitable outlet for morbid secretions of the tube and the continuity of its mucous membrane with the peritoneum render inflammatory affections of the canal of especial importance and make pelvic peritonitis a frequent consequence of salpingitis.

A prompt result of peritonitis from tubal infection is closure of the abdominal ostium of the tube by adhesions or by inflammatory changes in the fimbriæ. The tube then becomes filled with retained secretion, and is the center for an inflammatory process which extends through the wall to the neighboring tissues, especially the peritoneum. If this extension is not an immediate occurrence, the tube is subject to frequently recurring inflammatory attacks from slight causes. When the retained secretion consists of pus the liability to recurring attacks of pelvic peritonitis is much greater than when the accumulation is serous or mucopurulent. To this liability is added the danger of ulceration and thinning of the tube-wall and the possibility of pus escaping into the peritoneal cavity by perforation or rupture. Frequently the ovary becomes infected from the tube, suppurates, and affords a fresh source of danger. Both inflamed tube and ovary may act as further sources of peritonitis, but sometimes the tube, after infecting the ovary, recovers and is no longer a focus for infection. Infection of the ovary is very apt to occur when the latter has been the site of cystic disease or when a Graafian follicle has ruptured recently. The most frequent mode of infection is through a cyst-wall which has become adherent to a diseased tube. Sometimes the infection occurs through an ulcerative process which permits the tubal contents to enter the cyst suddenly by perforation of the cyst-wall. Tubo-ovarian abscess is thus explained. Such an infection may produce an attack of peritonitis more violent than any preceding.

A more alarming attack of peritonitis is engendered by the escape, through ulceration, of the contents of a suppurating tube or ovary into the peritoneal cavity. Fortunately, such an occurrence is rare. The thinned wall of such a collection is a menace which places nature upon her guard and stimulates her to form adhesive barriers which will limit the space into which the rupture occurs and favors the formation of an intra-peritoneal abscess. Such an abscess may enlarge rapidly, and, if the patient survives, may burst into one of the neighboring viscera, into the peritoneal cavity, or externally, according to its situation. Suppuration of an ovarian cyst may be independent of infection through the tube; occasionally, it probably occurs from the proximity to the rectum or intestine of an inflamed growth. The cyst is more vulnerable to such infection when it has been exposed to injury or subjected to bruising, as in labor.

Peritonitis may be favored by twisting of the pedicle of an ovarian cyst. This accident can result in strangulation, intracystic hemorrhage, inflammation, or necrosis of the growth, according to the amount of strangulation. The accident is particularly apt to occur during parturition.

The presence of puerperal sepsis should be regarded as demanding careful investigation. New pelvic growths, by their mere presence, may engender peritonitis. This is common in ovarian tumor. The tumor varies greatly in the probability of its producing peritonitis. Uterine fibromata may attain a large size without adhesions unless degenerative processes set in, while a papilloma of the ovary or tube, dermoids and malignant diseases usually are associated with extensive peritonitis.

Severe septicemia may follow abortion, parturition, or surgical manipulations, and, instead of being confined to the uterine mucous membrane, can be carried at once by blood-vessels or lymphatics to the peritoneum, and generate a diffuse septic infection in the pelvis. Such a peritonitis may become localized in the pelvis or may prove fatal by its rapid extension to the general peritoneum.

Clinical experience has demonstrated that injury alone will cause peritonitis only when the hand or instrument inflicting the injury is surgically unclean. The truth of this assertion is illustrated by the infrequency with which extensive operative manipulation within the peritoneal cavity is followed by inflammation, and by the frequent attacks of virulent and fatal peritonitis following slight injuries in efforts to produce abortion. It is, without question, a mere problem of infection. Usually in the latter the operator is ignorant or reckless.

Complications during parturition may cause peritonitis. The shape and size of the normal pelvis is adapted to the passage of the normally constructed child at full term, and is without extra accommodation. Any encroachment upon the pelvis by tumor, growth or malformation affords an obstacle which renders passage through the canal possible only at the expense of injury or bruising. This may result in loss of vitality of tissue or growth, and thus render the structures more susceptible to the influence of pathogenic micro-organisms.

Pelvic cellulitis, it has been said, is generally secondary, but still it may precede the peritonitis. This is particularly true of suppuration.

Pelvic hematocele is a source of peritoneal inflammation. The irritation induced by the blood diffused into the peritoneal cavity causes exudation and adhesive peritonitis. The blood-serum may be roofed in beneath adherent omentum and coils of intestine, when the peritonitis limits effusion and promotes its subsequent absorption.

Inflammation of the vermiform appendix, or appendicitis, is a not infrequent cause of pelvic peritonitis. Its normal situation is in the right inguinal region, just above the brim of the pelvis, but instances have occurred in which it was found lying within the pelvis. In right-sided inflammation of the pelvic peritoneum an inflamed appendix always should be regarded as a possible source of the infection. An abscess formation may follow, which will fill up Douglas' pouch. In many cases it is difficult to determine whether the appendix or the right tube is the original source of infection.

Pathologic Anatomy. Inflammation of the peritoneum may be serous, adhesive or suppurative; acute or chronic. As it most frequently originates from infection through the tubes, therefore, the tubes and ovaries are implicated. It begins as a congestion or hyperemia of the serous surface, with cloudy swelling of the endothelium. The membrane, instead of being smooth and glistening, becomes dull, dry, clouded, and slightly roughened with plastic lymph, which is poured out between its adjacent surfaces. The adhesions thus produced are its most characteristic feature. In recurrent attacks we find additional adhesions. Serum exudation becomes encapsulated. It is found in the meshes of the connective tissue, may fill the cul-de-sac or pelvis, posterior to the uterus, or it may be encysted to one side. Such collections may simulate a cyst. When the exudation thrown out is considerable, it may form a distinct coating, which may be peeled from the surface of the peritoneum. These lymph coagula are also found floating in the serum, and, as the fluid becomes absorbed, this coating stiffens the peritoneum, and, with the induration in the subjacent cellular tissue, causes the hardness which is one of the striking characteristics of chronic pelvic peritonitis.

Usually these indications of inflammation are most strongly marked about the fimbriated ends of the Fallopian tube, and diminish as they pass from it. When the inflammation has originated from some other cause, such as an inflamed appendix, the alteration and adhesions are most dense at the seat of origin. Thus, a Fallopian tube, when it becomes inflamed and increases in weight, drops from its original position, so that it is found upon the floor of the lateral fossa of the pelvis, in the pouch of Douglas, or adherent by its fimbriated end to the ovary or to the side of the pelvis. Occasionally the two tubes meet, and the distal ends become adherent to each other behind the uterus. At other points the direction of the tube may differ in two sides of the body. One side is bent like a horseshoe, while the other terminates against the lateral wall of the pelvis, to which it is adherent by its abdominal end. If the uterus is lifted out of the pelvis by pregnancy, the tube may be found situated above the brim, close to the border of the psoas muscle. The ovary generally is found implicated in the mass of inflammation which has extended from the tube. When this inflammation has existed for some time, we find the ovary in a cystic state, considerably enlarged. These changes result from the effect of the surrounding peritonitis.

In chronic cases the peritoneum is lifted up in places, by circumscribed collections of serous fluid in its meshes. These swellings vary in size from a pea to a large orange. They possess no pathologic importance, but often increase the difficulty in arriving at an accurate diagnosis. A mass formed by an inflamed tube, ovary, and broad ligament not infrequently is found adherent to the posterior pelvic wall and rectum. Sometimes a coil of intestine or a portion of omentum may intervene, when the parts are so entangled in an extensive mass of exudation as to cause great difficulty in outlining and determining their relations. The body of the uterus is enveloped in a mass of adhesions or is completely free. When the lesion from which the peritonitis has originated is purulent, peritonitis is apt to be purulent also, and, instead of an accumulation of serum, pus or intrapelvic abscesses are found. Occasionally, suppurative peritonitis exists. The latter occurs only in cases of exceptional virulence, or from sudden bursting into the peritoneal cavity of a pus-collection which was situated in an ovary or tube.

Intraperitoneal abscesses may be single or multiple. They generally originate by the rupture of a suppurating Fallopian tube or by the discharge of pus through its abdominal ostium into Douglas' pouch or into a space bounded by adhesions. Both tubes may thus discharge into a common receptacle, which is most generally Douglas' pouch. A tense, fluctuating swelling is formed, easily felt through the depressed vaginal roof, which, by pressure against the intestine, causes more or less obstruction. Purulent inflammation of the tube leads early to closure of the abdominal ostium, when the pus is confined within the tube, and forms what is known as a pyosalpinx. An intraperitoneal abscess or general peritoneal infection may then be induced by infection through the tubal wall, or by the bursting of the pyosalpinx from ulceration within, or by the spread of infective processes to the ovary, causing it to suppurate.

An intraperitoneal abscess walled in by adherent viscera may run an acute course or may be retained for a long time, causing few indications of its presence, if any. One of two things is likely to occur, however: either the abscess gradually dries up and disappears, or its walls undergo ulceration and its contents escape into the bowel—usually the rectum, sigmoid flexure, or colon—or into the vagina, the bladder, the general cavity of the peritoneum, or some part of the abdominal wall. The most frequent exit is through the intestine. The other routes are exceptional. Such abscesses differ markedly from cellulitic abscesses, and will quickly disappear when they have once found an outlet. The latter discharge their contents imperfectly. A troublesome sinus remains for years, producing serious ill health. Among the secondary changes resulting when salpingitis is unilateral is an extension of the peritonitis to the other side of the pelvis, involving the healthy uterine appendages in a mass of adhesions which complicate the function of both tube and ovary. Such a condition may be followed by hydrosalpinx.

Hydrosalpinx may result as a sequel of salpingitis, but is less frequent than pyosalpinx.

Effusion of blood within the tube (hematosalpinx) often arises as a consequence of tubal gestation, but occasionally may be independent of the latter.

Symptoms. The first characteristic of acute pelvic peritonitis is pain in the lower part of the abdomen, which is sudden in its onset. For a few hours it is extremely severe, associated with fever, with increased rapidity of pulse, and often with vomiting. An early symptom is more or less intestinal distention, which may be general or localized. Following the acute pain, movement is attended with great suffering, because of the tender, inflamed parts, and the patient is generally obliged to remain in bed for a length of time dependent upon the severity of the attack. Rigors are infrequent, unless the condition is part of a diffuse septic inflammation or the result of intraperitoneal rupture of a pyosalpinx or a suppurating ovary. Constipation is usual. Pain precedes defecation and micturition, owing to the contiguity of the inflamed part to the rectum or bladder. Not infrequently the pain is greater at the completion of micturition. The patient generally assumes the recumbent posture, with the limbs flexed, and guards the abdomen against the pressure of clothing or contact with the hand. In subacute or chronic cases pain in the back and inability to undergo physical exertion are experienced. Menstruation is more profuse than normal, often painful. Very trifling causes will result in recurrence of the attacks. This is particularly true when the chronic pelvic peritonitis is maintained by the presence of pelvic suppuration. Recurrence of pain and abdominal tenderness are more reliable indications of the presence of pus than is elevation of temperature. Not infrequently a large quantity of pus may be found in the pelvis of a patient who has either a normal or a subnormal temperature. Patients in whom extensive suppuration exists are found emaciated and incapacitaed for work or exercise. In the worst cases the patient will be bedridden. The amount of suffering depends upon the nature and extent of the disease and upon the social position of the patient; in other words, upon the demands that are made upon her activity. In an acute attack the abdominal muscles are kept rigid over the affected parts. This rigidity is due to muscular contraction, and is beyond the control of the patient. Occasionally, by abdominal palpation a definite swelling can be recognized. This is particularly true when the mass is situated above the brim of the pelvis, has attained a large size, or presents an encysted exudation of serum or pus in front of the uterus or against the pelvic wall. Occasionally the abdominal enlargement will be due to the presence of serous fluid. When depression of the vaginal roof occurs, it will not be lateral, but central, because the accumulation of effusion, serous or purulent, is in Douglas' pouch. Upon vaginal examination the parts may be very tender, with a sense of resistance, or the uterus is pushed forward. After subsidence of the acute symptoms a careful bimanual examination, for which an anesthetic may be required, often will reveal in the posterior fossa of the pelvis the presence of a fixed, irregular, tender swelling. This begins at the uterine cornu as a cylindric body, equal in thickness to a lead-pencil; it may be rolled between the fingers, but may suddenly become thicker a short distance externally; it curves itself, may completely reverse its direction, and finally ends behind the cervix uteri in the pouch of Douglas. A Fallopian tube can be adherent to the ovary, which is embraced within the concavity of its curve, and surrounded on all sides by a thickened, adherent peritoneum. The uterus is not always displaced, but is often found retroverted or retroflexed, and adherent in its abnormal position. Again, it may be pushed forward by a mass of effusion in Douglas' pouch. The shape and consistence of the swelling vary in different cases, as the tube may be soft, sausage-shaped (particularly when its abdominal ostium is occluded), or it may be distended mostly at the outer end, which gives it the shape of a retort. Occasionally it is irregular, distended from sacculation, thrown into knuckles or prominences, bent upon itself with sausage-like convolutions produced by intervening constrictions. Its consistence depends upon the extent to which the walls of the tubes have become thickened and upon the induration of the surrounding peritoneum.

Diagnosis. Peritonitis may be confounded with hematocele and cellulitis. Pelvic hematocele is distinguished readily by its clinical history, slight febrile disturbance, history of a possible tubal gestation, severe pain attending the rupture of the latter, and the subsequent bloody discharge from the uterus. Later, pelvic hematocele may be followed by peritonitis.

The distinguishing features between peritonitis and cellulitis are as follows:

Peritonitis.	Cellulitis.
1. Inflammation is confined chiefly to the pelvic peritoneum.	1. Inflammation principally affects the pelvic cellular tissue.
2. Inflammation is bilateral.	2. Inflammation is unilateral.

Differential Diagnosis.

PERITONITIS.	CELLULITIS.
1. Its onset is sudden, with severe pain.	1. Its onset is insidious, pain not marked.
2. Both legs are drawn up.	2. One leg is drawn up.
3. A firm, flat effusion surrounds the uterus or a mesial bulging is produced by serous effusion in Douglas' pouch; the vaginal portion of the cervix is of normal length.	3. A firm effusion bulges usually into the fornix of the one side; the cervix is apparently shortened on the affected side.
4. The inflammation does not extend along the round ligament and iliac fossa, but it may affect the entire peritoneum.	4. Exudation, or pus, spreads in definite directions, and usually is localized.
5. The uterus is displaced forward or backward.	5. The uterus is displaced to one side.
6. Vomiting is frequent.	6. Vomiting is infrequent.

Prognosis. The mortality of peritonitis is much higher than that of cellulitis. Even when the patient recovers, the after-effects are more troublesome, and frequently the sequels are sufficiently serious to entail a life of chronic invalidism. The disease from which the peritonitis originates remains after the subsidence of the acute attack, and constitutes a focus from which subsequent attacks are likely to result, either from changes in the diseased tissues or from external agencies. Recurring attacks of peritonitis are more likely to occur when associated with the presence of pus, either in the form of pyosalpinx, suppurating ovary, or intraperitoneal abscess.

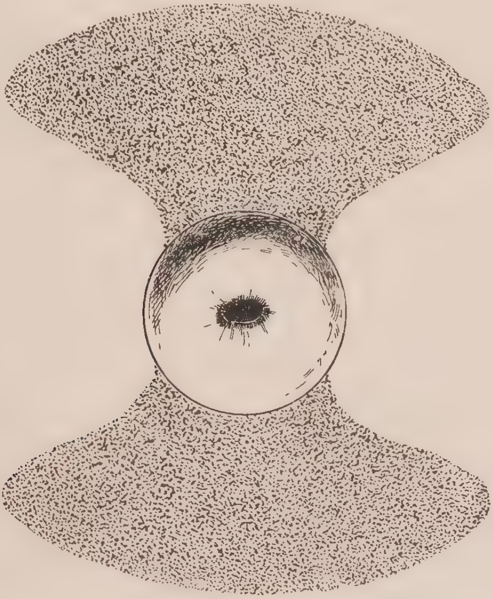


FIG. 343.—Induration from Peritonitis.

The damage done to the uterus, ovaries, and Fallopian tubes, particularly to the latter, by the obstruction of the abdominal ostium, necessarily causes sterility. If the gradual absorption of the morbid products permits the occurrence of conception, the continuation of pregnancy to full term may be rendered impossible by the inability of the organ to become enlarged because of extensive adhesions. It is not possible, however, to say that pregnancy cannot occur, for experience has demonstrated that even after the most virulent peritonitis the parts may so recover themselves as to permit of a subsequent conception. The discreet practitioner will consequently hesitate to assert positively that the patient cannot give birth to children. Another effect of pelvic peritonitis is *interference* with the normal action of the intestinal canal.

The termination must depend upon the condition of the individual patient.

Treatment. The first and most important aim of treatment is prevention. The large majority of nonpuerperal cases of pelvic peritonitis originate from a preëxisting gonorrheal salpingitis; consequently the treatment should consist in the arrest of the infection before it has extended beyond the reach of local application. Unfortunately, gonorrhea is frequently regarded as an unimportant affection, although it probably destroys the health of a larger number of women than does the more dreaded poison of syphilis. The earlier symptoms of the disease usually pass unregarded. They are attended with but little pain—often none, if the urethra is uninvolved—and the significance of the purulent discharge is not realized. Medical advice, consequently, is unsought until the infection has produced serious results or has inflicted life-long damage. Even when advice is obtained, the disease seldom is regarded seriously, and vigorous treatment is not employed. A purulent vaginal discharge in a recently married woman should always be regarded with grave suspicion, and its treatment should be undertaken with a due sense of responsibility.

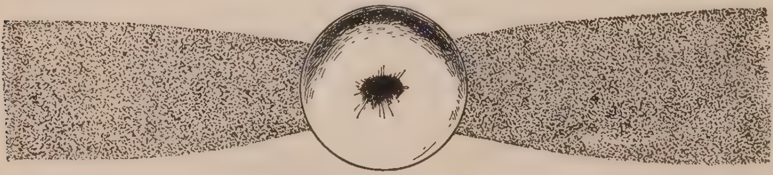


FIG. 344.—Induration from Pelvic Cellulitis.

The object of treatment should be to prevent the extension of disease to the tube or the development of septic salpingitis. Its occurrence means a focus for the continuous distribution of infection and a cause for frequently recurring attacks of peritoneal inflammation. Such invasion, as would naturally be inferred, is a frequent consequence of gonorrhea, but its avoidance requires rigid adherence to the rules of aseptic surgery and midwifery in the management of abortion, parturition, and surgical manipulation. Care should be exercised in the examination of patients, and particularly when such investigation is to be intra-uterine.

When a patient has once suffered from pelvic peritonitis, it is extremely important that all causes likely to provoke a relapse should be avoided. She should be careful in her dress, not be exposed to cold or damp, especially during her menstrual period, and should guard against exhausting exercise or overfatigue. Prolonged standing is as disastrous as excessive exercise. She should be advised to secure sufficient rest, and the action of her bowels should be carefully regulated. Intestinal adhesions naturally aggravate the tendency to habitual constipation. Fecal accumulation favors development and migration through the coats of the intestines of pathogenic micro-organisms, hence constipation should be overcome by proper regimen, suitable aperients, or enemas of glycerin or of soap and water. The medical treatment is similar to that employed in pelvic cellulitis, with the exception that opium and its derivatives may be necessary. Their administration, however, should be regarded as an unavoidable evil. Only small doses should be given and these discontinued as early as possible. Constipation should be prevented by appropriate aperients or enemas, or both. Accumulation of scybala is more harmful than active purgation. During an acute attack the patient should rest in bed, and the diet should be restricted to liquid or easily digested food at regular intervals. The pain should be relieved by the application of the ice-bag, or, if this is uncomfortable, by hot fomentations. Intestinal distention is relieved by the use of enemas. The patient will probably be tormented by thirst and by the desire for ice or effervescent waters. She will find greater relief from frequent sipping of hot water. Ice should be avoided, as, when once employed, it increases the thirst. The patient will constantly demand it, but if granted, the mouth and tongue will soon suffer from a severe attack of glossitis. If the enemas fail to give relief, an aperient should be administered—doses of calomel, castor oil, or, what is more efficient, sulphate of magnesium. The last may be given in one- to two-dram doses, dissolved in syrup of ginger and cinnamon-water, every two or three hours until the bowels are freely evacuated; subsequently three or four times a day, as the condition may demand. The state of the pulse is a more correct guide to the condition of the patient than the temperature, and will indicate the need for stimulants. If the pulse shows signs of flagging, becomes thin, feeble, and intermittent, brandy or whiskey should be given in regular doses, diluted with five or six times the quantity of water, its effect being carefully watched, the dose to be increased or diminished according to its influence. Stimulants should not be allowed to take the place of food. The indications of collapse—coldness of the extremities, sunken features, flagging pulse, subnormal temperature—should be further combated by the application of external heat and by the hypodermatic injection of strychnin and atropin or digitalin. The intensely depressing effect of intestinal distension should be kept in mind, and this condition should be relieved by the use of enemas or by the introduction of a soft-rubber rectal tube with the patient turned upon the side. Not infrequently, as suggested by Keith, an injection of quinin, gr. vj, whiskey, fʒss, and water, fʒij, repeated every hour until three doses have been given, stimulates the nerve-centers and increases peristalsis. The most effective enema is an ounce of powdered alum dissolved in a quart of hot water. This is best given with the patient lying either upon one side or upon her back, with the hips elevated. The alum enema promotes peristalsis, and, consequently, is of service in tympanites. Where peritonitis is established and the patient is ejecting a dark-green fluid from the stomach and is unable to retain even liquids, the stomach should be irrigated through the stomach-tube with a normal salt solution. This should be repeated if the vomiting returns. No food, not even water, should be allowed to enter the stomach. Peristalsis should be quieted by injection of gr. 1/6–1/4 morphin hypodermatically, followed by gr. 1/16–1/12 of the same agent every three hours. The nutrition should be maintained by rectal feeding, administering normal salt solution three ounces, bovinine one ounce, every three or four hours, and, where necessary, hypodermoclysis or intravenous injections normal salt solution may be employed.

The occurrence of peritonitis should lead to a careful examination of the pelvis, and any indication of tenseness in Douglas' pouch or about the cervix should be considered an indication for immediate vaginal incision to break up the tissue and permit the fluid to escape. The opening should be kept patulous by the introduction of a gauze drain. Such a course will frequently arrest or limit the progress of the inflammation. The mere removal of the tension affords great relief. If an intraperitoneal abscess exists, such interference not only affords relief, but may anticipate its bursting into the rectum and establishing a troublesome sinus. Unless such conditions can be determined, however, it is wiser to defer surgical intervention until the acute symptoms have subsided. If the attack is the first the patient has had, and the swelling is so slight as to indicate a probable nonpurulent inflammation, operative interference should not be advised. If the patient has had similar attacks repeatedly, and swelling of such a size is found as to render it probable that in its midst there is an occluded, distended Fallopian tube or an enlarged, cystic ovary, operation should be urged. Such a mass, with the recurring attacks, almost positively indicates the presence of pus; and where pus is present, surgery is absolutely indicated. It is impossible, of course, to lay down positive rules; every case must be decided individually. A woman from the laboring-class cannot afford to spend as much time in invalidism as a woman in better circumstances. Advancing peritonitis with evidence of pus or inclination to suppuration should be subjected to drainage. An incision above, and parallel to each Poupart's ligament, another, well back in each lumbar region and in the vault of the vagina, will afford, through ropes of gauze, vent for the accumulating effusions. The operative procedure in cases demanding such drainage should be done with the greatest expedition and with no effort to flush out the peritoneum. This can be accomplished more effectively by what is known as the Murphy treatment with the patient in the Fowler position. The patient is placed in a semi-sitting position with the nozzle from a fountain syringe or suitable apparatus in the rectum. The fountain is raised but a little above the level of the body, the tube pinched so that the fluid (normal salt solution) is delivered at the rate of thirty minims to a dram to the minute. Where the fluid is retained, three to six pints are thus introduced into the circulation in each twenty-four hours and the influence in stimulating elimination is extremely gratifying. In cases drained in this manner the peritoneum is flooded freely. In enfeebled patients, the instillation can be conducted with the patient in the recumbent position, but the drainage is not so satisfactory.

When operation has been decided upon as necessary, the method of procedure still remains undetermined. Abdominal section, being the older and more generally adopted procedure, will be described first. (For the preparation of the patient see Section 131.) The patient is placed upon the operating table, preferably one by which the Trendelenburg posture can be secured, and an incision from 2 1/2 to 3 inches long is made in the median line, beginning an inch above the symphysis pubis. The operator must remember the possibility of adhesions between the intestines, the omentum, and the anterior abdominal parietes, and should proceed carefully as he approaches the peritoneal cavity. Generally the omentum is adherent to the mass in the pelvis, over the surface of the uterus, the tubes, or the ovaries. The first step is to separate these adhesions and to free the omentum and adherent coils of intestine. The omentum and intestines are drawn upward to express the matted contents of the pelvis beneath them. When the patient is in the flat position, the operator must be guided almost entirely by the sense of touch. In the Trendelenburg posture the manipulations can be conducted by sight. Following the fundus of the uterus as a guide, the operator endeavors with the tips of the first two fingers to enucleate the diseased uterine appendages from their adherent surroundings. The uterine fundus may be free or implicated in the adherent mass. In the latter case its identification may be exceedingly difficult, rendering it necessary for an assistant to pass one or two fingers into the vagina to elevate and press the uterus against the cervix. The fundus is thus identified. The affected tube, on one side, is traced out from the uterine cornu and made to serve as a guide when searching for planes of cleavage. If it turns backward and becomes lost in the adherent mass, the safest way is to keep the fingers close to the posterior surface of the uterus, and to trace the adherent mass downward to Douglas' pouch. In breaking up the adhesions it is necessary to separate the mass from the walls of the bowel, including the anterior wall of the rectum. It is often advisable to have an assistant pass his forefinger into the rectum, partly to facilitate the separation by steadying the bowel, partly to ascertain where the bowel is and whether the manipulation is in dangerous proximity to it. The separation of these adhesions in Douglas' pouch is generally the most difficult part of the operation. Indeed, I know of no operation more difficult than to break up adhesions which have existed for a long time between knuckles of intestine and the fundus of the uterus or the ovaries and tubes. The separation is to be continued posteriorly from below upward. When the mass has been cleared from its posterior and inferior attachments to the uterus and to the uterine appendages of the opposite side, there still remain adhesions to the back of the broad ligament, which has become more or less folded over the diseased parts, and forms a deep, concave surface on its posterior aspect. This concave surface has to be unfolded in order to permit the mass to be brought into view and the broad ligament below it to be transfixed. This separation can be accomplished by working from below upward, and should be continued until the ovary and tube remain attached to the uterus and broad ligament by their anatomic connections only. The pedicle is then tied in the same manner as in the removal of the normal ovary and tube for the relief of myoma. The appendages on the opposite side are examined, and are removed or left, according to their condition. If merely adherent, the operator may content himself with separating the adhesions.

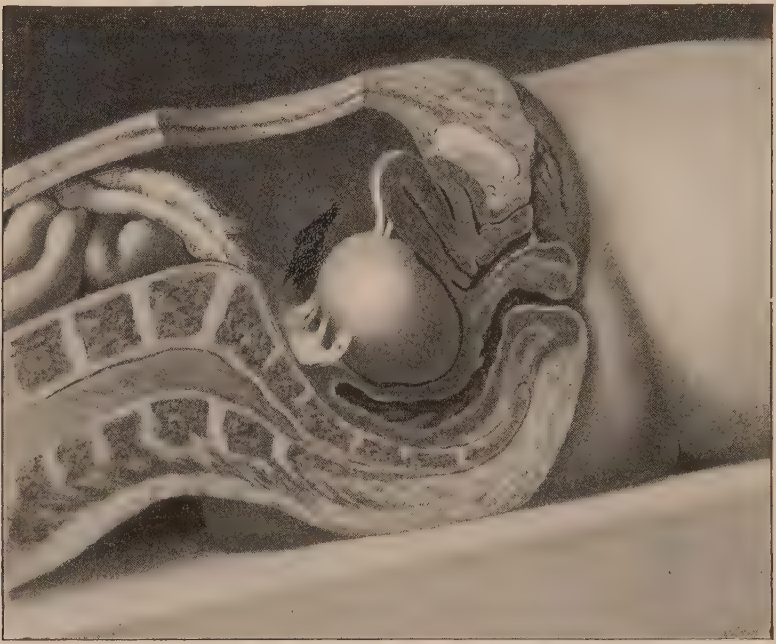


FIG. 345.—Intestines Held Back by Gauze. Patient in Trendelenburg Posture.

During such manipulation it is not unusual to find an escape of pus which may be independent of any fault of the operator. Often it is difficult to accomplish without rupture the separation of adhesions around the ostium of a suppurating tube or the enucleation of a suppurating and adherent ovary the wall of which is thinned and nearly ready to burst. Fortunately, unless the pus is unusually virulent, no serious harm results. However, in such cases, we should always exercise care to use several layers of gauze pads to wall off the general peritoneum and intestine to prevent their being soiled. (Fig. 345.) Occasionally, in severe cases, when the patient is much depressed, the persistence required for the separation of extensive adhesions would so prolong the operation as to endanger the life of the patient. Then it may be necessary to content ourselves with mere emptying and draining of the suppurating cavity. The greater the experience of the operator, however, the less frequent will be the incomplete operation. Separation of adhesions between different parts of the intestinal canal other than the rectum should be made as much as possible under the eye, and any injuries to these structures should be repaired immediately. The inexperienced operator should be careful not to mistake a thickened and adherent intestine for an inflamed Fallopian tube. This mistake may be avoided by following the tube toward the uterus before an effort is made toward its separation.

During the performance of these operations the general peritoneum should be carefully protected by drawing back the intestines and omentum, and retaining them with gauze or gauze sponges, so that they shall not be soiled by rupture of an abscess cavity. When the operator and his assistants have been unable to protect the intestines from contact with the contents of the abscess, I think it better to irrigate the abdomen with hot normal solution, 105° to 112° F., and thus complete the peritoneal toilet rather than to attempt to accomplish it by dry sponging. In such cases the belly cavity may be left filled with the salt solution. Drainage must be decided by the indications of the individual case. The larger the experience of the operator, unless he is particularly prejudiced, the less will he be likely to use drainage. Even in the most virulent cases, with extensive adhesions, irrigation of the cavity with a large quantity of normal salt solution, repeating it before the cavity is closed and leaving a considerable quantity of fluid within the abdomen, dilutes any poison that may remain and renders it less active or likely to produce deleterious effects. In this way drainage may be avoided. In suppurative peritonitis McCosh suggests intra-intestinal injections of saline cathartic. He cleanses the peritoneal cavity thoroughly with irrigation instead of sponging. Between one and two ounces of a saturated solution of magnesium sulphate is introduced through a hollow needle into the small intestine at a point as high as possible in the jejunum or ileum. The needle-puncture is closed by a Lembert suture. The action of the saline produces free watery discharges, and thus makes the intestine act as a drainage-tube for the peritoneal cavity. When drainage is used in suppurative cases, the gauze or wick drain, in which a number of strands are introduced into different

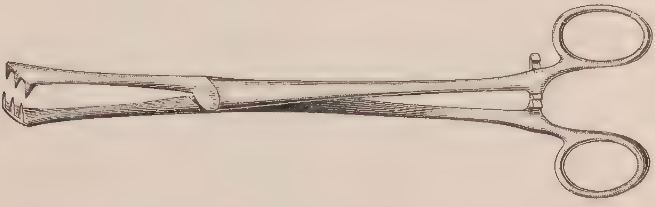


FIG. 346.—Three-pronged Vulsellum.

parts of the abdominal cavity, is the preferable method. If the ends are carried well around the side of the body and are surrounded by cotton and gauze at a point below the level of the internal ends, we then secure a siphon-like action, which drains the cavity more effectually.

Fowler suggested elevation of the body of the patient so that the drainage may accumulate in the most dependent portion of the abdomen, whence it can be siphoned by a gauze wick emerging from the lower angle of the wound or into the vagina. This has appealed to the profession as the most satisfactory procedure. In closure of the wound we must endeavor to utilize measures that will bring together and hold in apposition the tissues, so that firm union may be secured and the risk of hernia lessened. Various methods of procedure have been employed such as the introduction of a double row of sutures or of a series of sutures, one in the peritoneum, another in the aponeurosis, and another in the skin. The difficulty in the introduction of rows of sutures, however, is that frequently dead spaces are left in which an accumulation of fluid occurs. This becomes infected later and results in the formation of an abscess, which

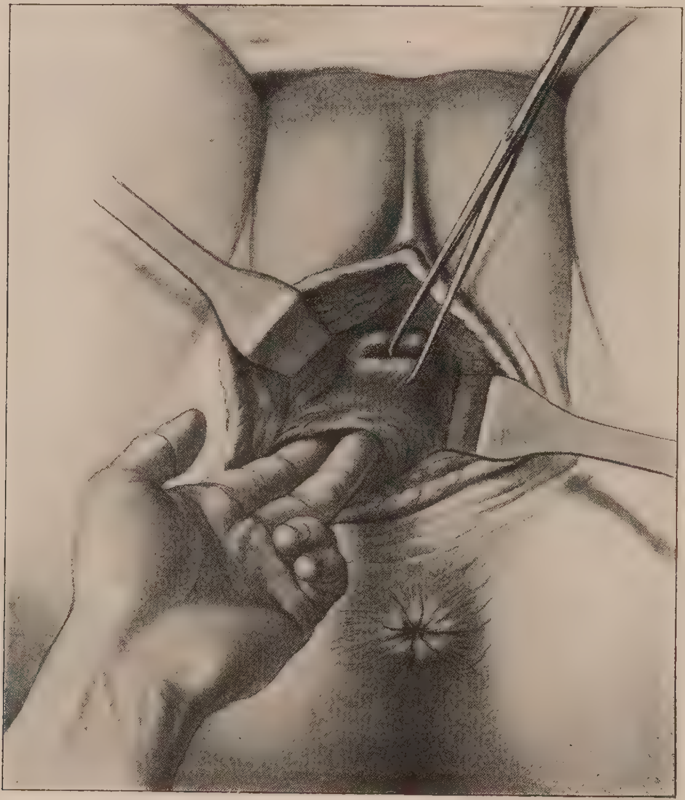


FIG. 347.—Vaginal Incision for Pus-collection in the Broad Ligament.

necessarily weakens the wall. I endeavored to obviate this difficulty by the employment of the figure-of-8 suture. The suture was made to cross just in front of the aponeurosis or that portion of the abdominal wall which it is most important to maintain in apposition. The figure-of-8 suture was designed to accomplish the same purpose as a double row of sutures, but with the advantage that the suture could be removed. It was found to have a disadvantage, however. In order to secure apposition of the tissues, the suture was likely to be drawn so firmly as to result in a slough, which produced a stitch abscess.

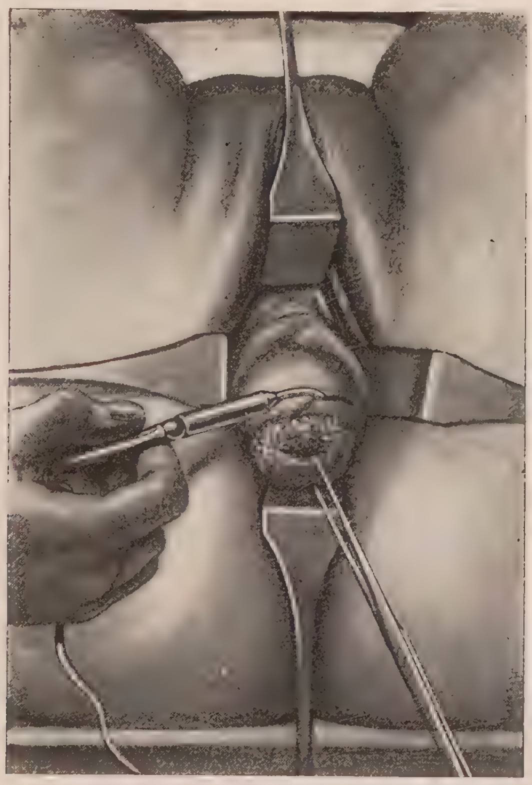


FIG. 348.—Incision through Vagina with Thermocautery in Vaginal Excision of the Uterus.

I have experienced the greatest satisfaction in a combination of continuous chromic catgut suture with interrupted silkworm-gut sutures. Beginning at either angle of the wound, the catgut suture is introduced external to the aponeurosis upon one side of the wound, brought out in the peritoneum and fascia of the opposite side, and then through the edges of the peritoneal wound until the other angle of the wound has been reached, when it is brought out above the aponeurosis. Silkworm-gut sutures are now introduced, including all the tissues above the peritoneum, the wound is cleansed, and the catgut suture continued, uniting the edges of the aponeurosis, when the wound is carefully dried before the introduction of the last turn and the tying of the knot. Again drying the wound, the silkworm-gut sutures are tied. This procedure gives secure union of the peritoneum, aponeurosis, and skin with but one buried knot. When twenty-day catgut is used, the wound should be secured firmly against subsequent weakness.

The silkworm-gut sutures serve as supports to the wound, and should be tied only closely enough to hold the surfaces in apposition. The after-treatment is similar to that of other abdominal operations. (Section 150.) The combined crescent and vertical incision (Fig. 151), where large masses do not have to be removed, has given me great satisfaction. It greatly lessens the danger of hernia, while affording an opportunity to conceal an unsightly scar beneath the pubic hair.

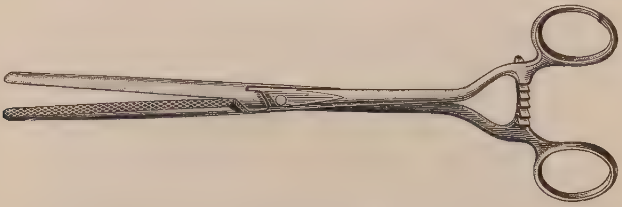


FIG. 349.—Clamp Forceps for Securing the Broad Ligament.

Vaginal Section and Uterine Castration. Many clinical observers have appreciated that the infected uterus, from which disease had been transmitted to the peritoneum and appendages, has continued to be a cause for discomfort and ill health after the secondary foci of infection—the appendages—have been removed.

Péan, in 1886, to insure relief in such cases, advocated the removal of the uterus through the vagina as a routine procedure in all cases in which that organ had been involved in an infectious process. This operation he designated as uterine castration. Subsequently the procedure was popularized by the advocacy of Segond and Jacobs. The diseased appendages may or may not accompany the uterus in its removal. In preparing for this operation the following instruments should be sterilized: Three double tenacula; four vaginal retractors; a knife; one pair of straight scissors and one pair curved on the flat; four large and twelve small pressure forceps; an angiotribe; a Deschamps ligature-carrier; a needle-holder; needles, threaded with silk loops; chromic catgut, sizes 0 and 2.

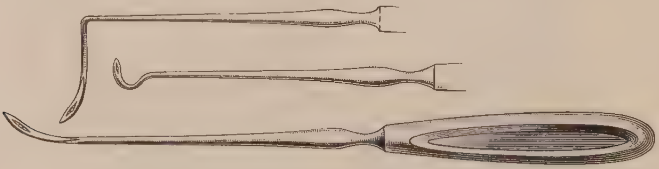


FIG. 350.—Deschamps Needle Ligature Carrier.

The operator may also have at hand the thermocautery and a large number of sterile gauze sponges. The steps of the operation are similar to those in the performance of the ordinary operation of vaginal hysterectomy. The patient is prepared as directed in Section 131. She is placed in the lithotomy position, and the uterus is exposed by vaginal retractors, one anterior, a second posterior, and one on each side. These retractors are held by two assistants. The cervix is seized by a vulsellum or double tenaculum, dragged down, and a circular incision made through the vaginal walls, which will be nearer the os externum anteriorly than posteriorly.

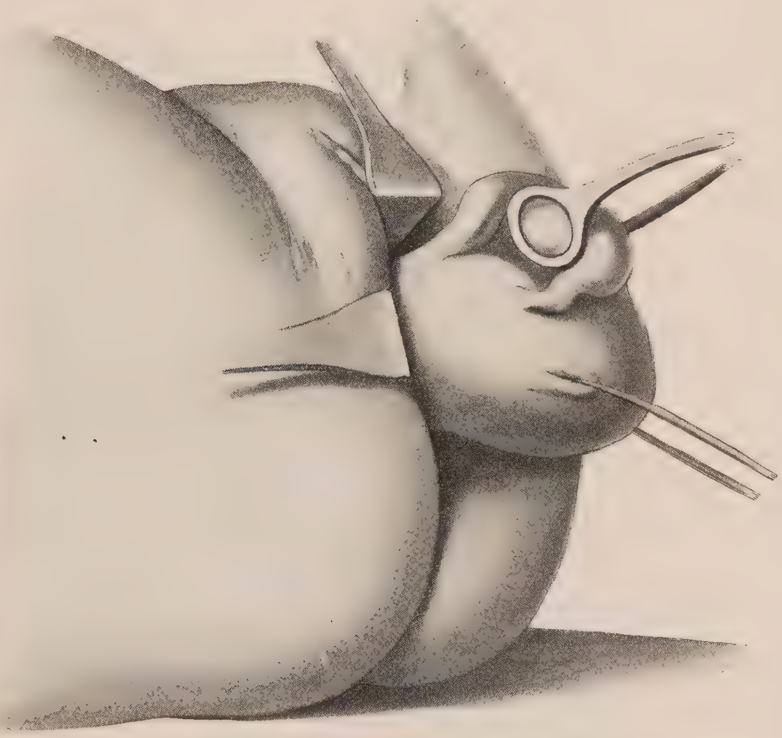


FIG. 351.—Drawing Down the Fundus.

Behind, the incision extends for half an inch or more above the os. If required, additional room can be secured in the vagina by lateral incisions in the vaginal wall which extend for half an inch outward from the circular incision, and parallel with the broad ligament. The incision about the uterus often is made with the thermocautery. This has the advantage that, in addition to decreased bleeding, the burn prevents the surfaces from immediate union and affords better opportunity for drainage. After cutting through the vagina the tissues are pushed away from the cervix with the finger. The separation between the bladder and the cervix is accomplished by blunt dissection with the finger or some blunt instrument, or by successive snips of the scissors. The late Joseph Eastman inserted the scissors, closed, near to the cervix and then separated the blades, which facilitated the dissection. The dissection can be accomplished posteriorly more rapidly as there is but little danger of injuring the rectum. The dissection is completed front and back by opening the peritoneal cavity when the uterus is held by the broad ligaments, through which pass the uterine and ovarian arteries. The tissues upon each side are divided with successive snips of the scissors, and the uterine artery is seized with forceps as soon as exposed, or immediately when cut. The fundus of the uterus can then be tilted forward through the anterior fornix of the vagina. This permits the cervix to be carried upward. With the fingers passed over the fundus of the uterus, the ovary and tube are followed upon the tense surface of the broad ligament and dragged down.

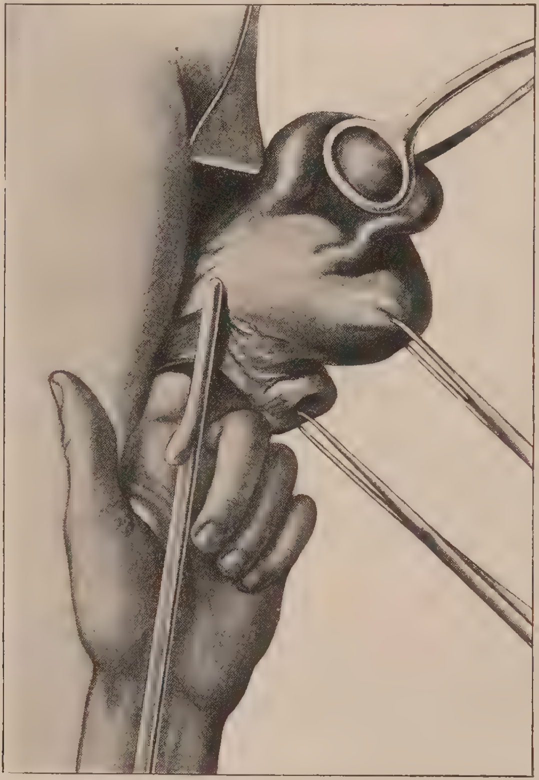


Fig. 352.—Application of the Clamp Forceps to the Lower Portion of the Broad Ligament.

A chromic catgut ligature is carried through the ligament and firmly tied when the hemostatic forceps are applied above the point of ligation. Usually this is done first upon the left side, after which the broad ligament is cut between the uterus and the forceps. Readier access is so afforded to the right tube and ovary which is treated similarly. The uterus and appendages thus are freed from their attachments. The remaining vessels are ligated. If the condition of the patient is such as to demand expeditious operation, the broad ligaments may be controlled by compression forceps only, and the operation completed by simply packing the vagina with gauze. The gauze should be carried between the forceps and well over their internal ends, in order that the intestine shall not be injured. Pryor used strong forceps with movable handles. Forceps and vulva are covered with a sterile dressing and the patient is put to bed. The forceps should be allowed to remain for forty-eight hours, the gauze for four or five days. The clamp method, while expeditious, has the disadvantage, however, that the tissue enclosed in the grasp of the forceps undergoes necrosis, and causes a disagreeable odor for two or three weeks subsequent to the operation. This necrotic process is a worry to the patient, nurse, and physician. Where several such patients are in a ward, the atmosphere is rendered disagreeable. There is always the possibility of infecting the parametrium and peritoneal cavity and operators generally prefer to use the ligature. For a time the angiotribe was much used, but if the tissue has undergone inflammation and contains more or less exudate, the angiotribe should not be used. It crushes this

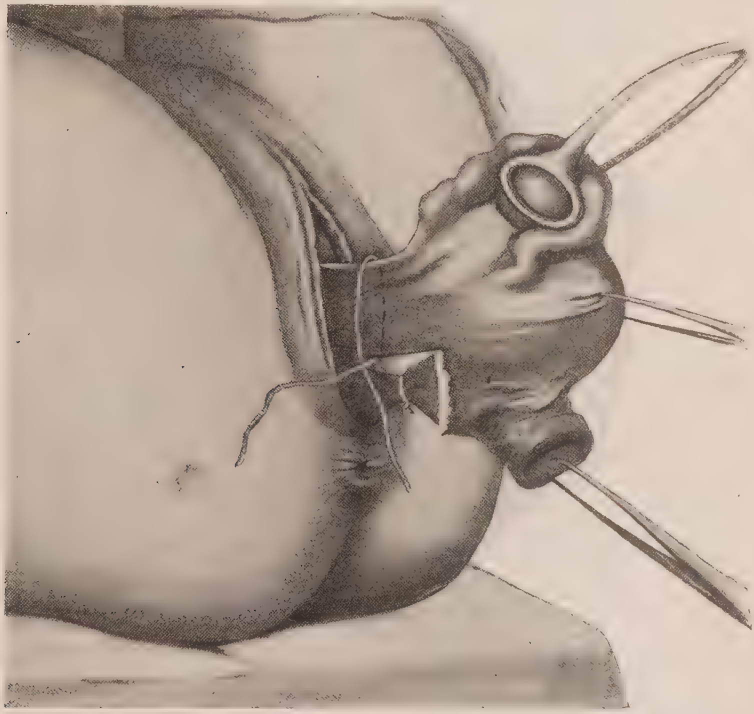


FIG. 353.—Ligation of the Broad Ligament in Vaginal Hysterectomy.

tissue, indeed almost bites it off, and therefore, does not preclude the possibility of bleeding. In the use of the ligature care must be taken to tie it so firmly that it will not slip. The uterine arteries should be picked up separately and do not require a large mass within the ligature.

Chromic catgut should be preferred for ligatures in the pelvis, although it has the disadvantage of being more apt to slip. Pelvic ligatures are likely to become infected. Silk engenders a profuse discharge, extensive granulations, and a condition which is uncomfortable for the patient and a source of worry to the physician. The use of the electrothermic angiotribe as suggested by Dr. A. J. Downes, cooks the tissues to such a degree that hemorrhage is effectually controlled and there is no ligature to act as a source of irritation. This seems an ideal procedure, but it necessitates the use of an additional apparatus which requires skilled attention. When the inflammatory exudate in the pelvis has been extensive and has gone on to suppuration, so that we have pus-sacs in the broad ligament or in Douglas' pouch, the preferable plan of procedure is to make the incision through the posterior cul-de-sac, open, evacuate, and irrigate the pus-sacs before the general peritoneal cavity is opened and disturbed. Gauze may be packed into the pelvis temporarily during the remaining

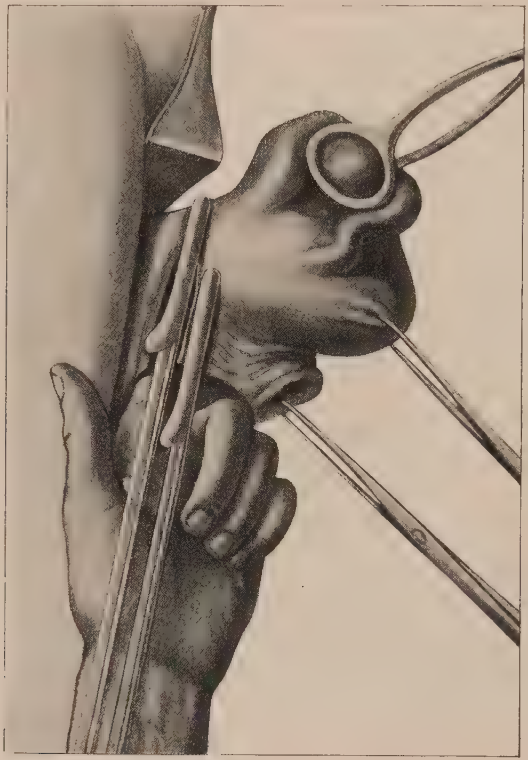


FIG. 354.—Upper Portion of the Broad Ligament Secured by Clamp Forceps.

steps of the operation. In some cases the uterus is so bound down by inflammatory exudate that the dissection through the anterior fornix of the vagina is somewhat difficult. In these cases the operation may be expedited by splitting through the anterior lip of the uterus, holding each side of the organ with the double tenaculum, and drawing it down while the cervix is being split. This affords a better opportunity to observe the relation of the bladder and the uterus, and to keep within the layer of connective tissue in the septum. Splitting the cervix and making traction upon its sides enable us to see the relation of the bladder and, consequently, to avoid injuring it. Another modification is the amputation of the cervix after the lower part of the broad ligament has been cut through. This permits readier rotation downward of the fundus through the anterior fornix, as it has a shorter arc through which to rotate. The fundus of the uterus may be rotated through the posterior fornix, but the anterior is preferable, because it puts the broad ligament more readily upon the stretch and enables us to find better the lines of cleavage between the tube and ovary and the other adherent viscera. If the ovary and tube are not readily brought down, or if the patient is suffering from chronic hyperplasia of the tubal and ovarian structures, by which these organs are often largely obliterated, a clamp may be applied on either side of the uterus prior to its removal. After its removal, more room is given to reach the appendages, but should the adhesions be firm and resistant, the tubes may be permitted to remain after breaking open and packing with iodoform gauze all pus-pockets. As the great majority of these cases have been infected, it is better to keep the wound open by packing it with iodoform gauze than to close the vagina and peritoneal surfaces. Landau advocates and practises the bisection

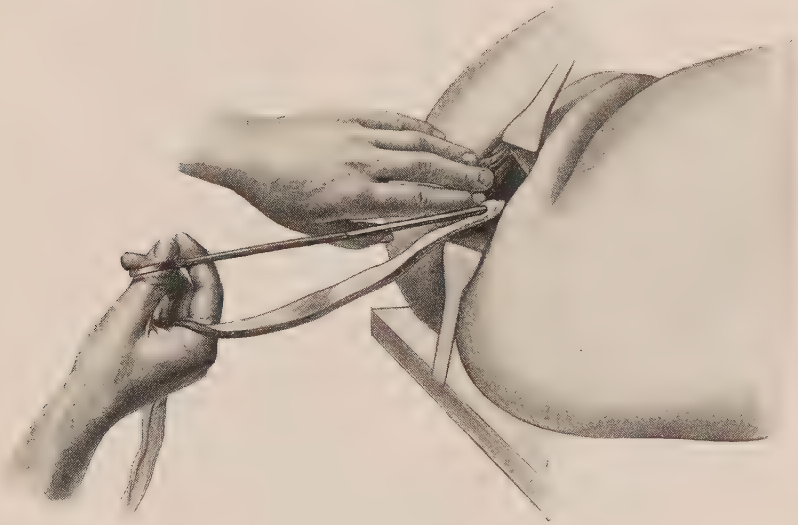


FIG. 355.—The Introduction of Gauze after Removal of the Uterus.

of the uterus through the anteroposterior line as a preliminary. One-half of the organ is pushed upward, the other is drawn down. This procedure gives more room for the manipulation necessary in the application of forceps, the use of the ligature, or in crushing with the angiotribe. It affords better opportunity, also, for dealing with the infected tube and ovary. As a preliminary, the intestines and peritoneum can be protected by packing with sterile gauze before we proceed to enucleate or separate the ovary and tube. In the employment of pieces of gauze it is very important, however, that the end of the gauze should be fixed with a pair of hemostatic forceps, as the pad is very readily worked upward into the peritoneal cavity by intestinal peristalsis, and may easily get beyond the reach of the surgeon. Nothing is more annoying than to perform an operation expeditiously, and subsequently have to lose valuable time in hunting sponges. The nurse who dispenses the sponges should do nothing else, and should keep an accurate account of the number of sponges she has given out. These should be accounted for before the operation is considered completed.

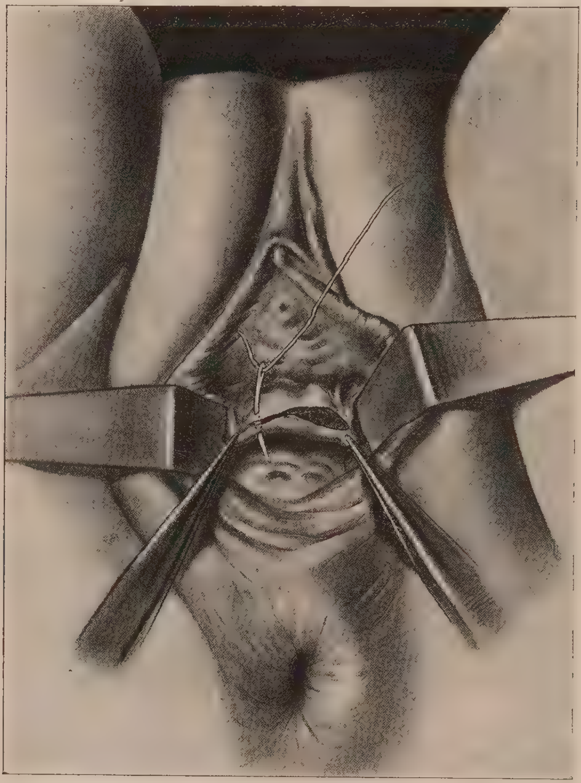


FIG. 356.—Closure of the Vaginal Wound by Sutures.

Whenever possible the peritoneal cavity should be closed and this can be done unless adhesions have been very extensive. The peritoneum front and back should be secured to the corresponding vaginal walls, the stumps held by forceps above; the ligated mass is secured in each angle of the vagina by a suture passed through the anterior and posterior vaginal walls and tied over it. A pursestring suture closes the peritoneal space intervening. The end of each stump should then be pushed behind the vaginal wall and the vaginal incision closed. (Fig. 356.)

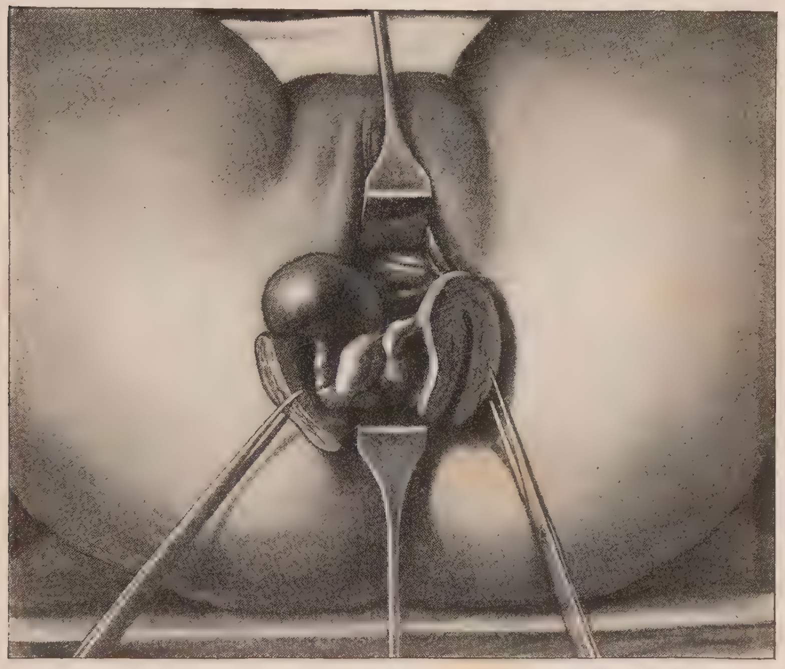


FIG. 357.—Landau's Method of Delivering the Uterus after its Complete Median Section.

DISPLACEMENTS OF THE PELVIC ORGANS.

252. Displacements of the Pelvic Organs. The relations of the structures of the vulva are modified and distorted by hypertrophy, varicose veins, inflammatory exudates and deposits, edema, hernia and tumors. They are, however, so intimately connected with the deeper structures that they are not subject to anything like displacements. All the other pelvic structures are capable of more or less marked displacement; still all are so closely related to and dependent upon uterine deviations that we will proceed to the consideration of the uterus and its displacement as a primary subject.

Physiologic Movements of the Uterus and the Forces by Which it is Sustained. The uterus is a freely movable organ. With its fundus at or a little above the level of the brim of the pelvis, it is suspended in the pelvis by the action of the uterosacral, the uterovesical, and the inferior portion of the broad ligaments. It occupies the axis of the pelvis, with its cervix directed toward the last sacral vertebra. The supports of the uterus are not ligaments in the ordinary sense, but consist of connective tissue, into and through which run prolongations from the uterine muscular structure, so that the organ is to some degree sustained by muscular action. This is evident from the fact that the organ moves upward and downward with every respiratory excursion, changes its position with that of the body, and is influenced by the distention and condition of the surrounding viscera. In the normal position the uterus rests forward upon the bladder, in a position of slight anteflexion, while the cervix is directed almost at a right angle to the axis of the vagina. The uterine position is markedly changed by the distention of the bladder, which raises the fundus and decreases the angle between the uterus and vagina until it becomes exceedingly obtuse (Fig. 358). In marked distention, indeed, the uterine axis becomes nearly parallel with that of the vagina. The cervix is pushed forward by a distended rectum. (Fig. 404.) When the rectum and the bladder are both distended, the uterus is elevated, and no longer finds room between these two viscera. It will be seen that the muscles, arranged as just mentioned, support the cervix. The movements of the body of the uterus are influenced by the broad ligaments on each side. These prevent its undergoing lateral change of position. The round ligaments act as stays to prevent it from falling backward, or draw it forward, when the bladder

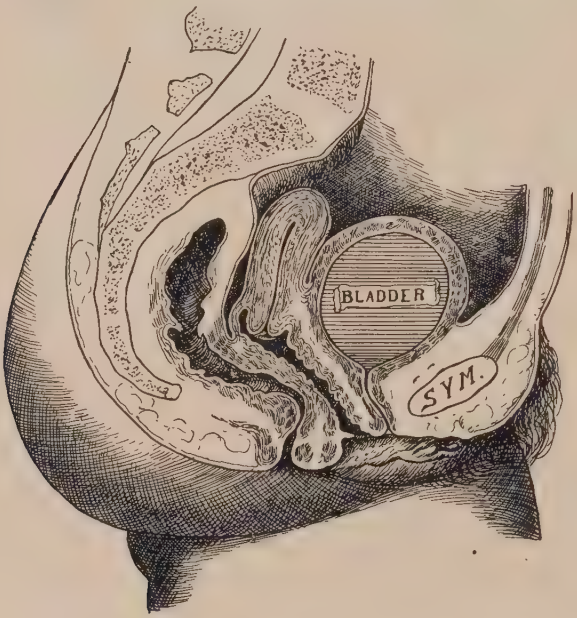


FIG. 358.—Uterus Displaced by Distended Bladder.

is emptied. The round ligaments are, of course, an insignificant force, but it must be remembered that the uterus weighs less than an ounce. It can be understood, therefore, how they serve to maintain the uterus far enough forward to permit the intra-abdominal pressure to be directed against its posterior surface. So long as the intra-abdominal pressure continues on the posterior uterine surface the uterus is held forward against the bladder. It is also important for maintenance of the uterus in its normal place that the muscular structure of the pelvic floor shall remain in normal condition. Relaxed vaginal walls or muscular structure, occasioned by injury to the pelvic floor in which the perineal muscles—particularly the levator ani—are torn through, withdraws a support, which sooner or later favors displacement. The normal condition of the peritoneum is a factor. This structure is certain to be affected by loss of muscular tone and of muscular support. It is not one factor, then, but several, which combine to maintain the uterus in its normal relations.

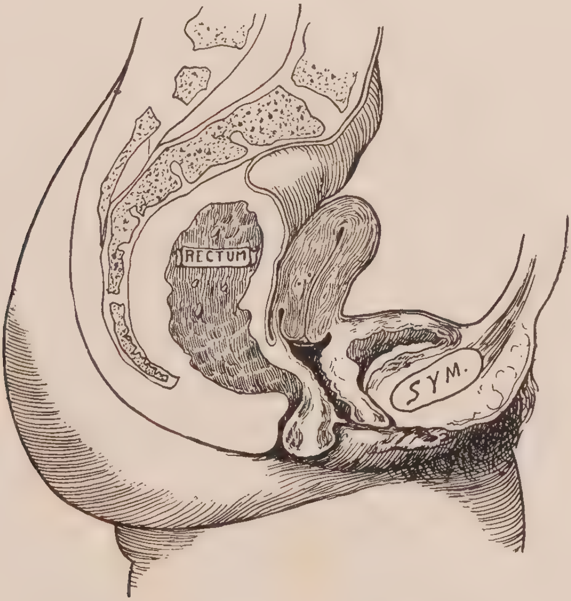


FIG. 359.—Uterus Displaced by Impacted Rectum.

Pathologic Changes and What Constitute Them. From what has been said of the physiologic changes of position in the situation of the uterus it can be seen how difficult it is to draw the line of demarcation between physiologic and pathologic changes. It may be said that when the uterus undergoes such changes in its structure or envelopes that it becomes stable in a position which is at times regarded as physiologic, it becomes pathologic and is known as displacement. Thus, the uterus may be pushed backward by a distended bladder, which will increase the angle between its axis and that of the latter; but if it does not follow the bladder forward when that organ is emptied, the position becomes abnormal.

These changes may result from:

1. Neglect of hygiene, either in permitting the bladder to become habitually overdistended or the rectum to be loaded with fecal matter until the uterus is so driven back that the intra-abdominal pressure is no longer directed upon its posterior, but falls upon its fundus or anterior surface. These changes will lead to an abnormal fixation.

2. Inflammatory changes in the uterus, leading to increased weight of the organ, straightening of the body, loss of its normal curvature; and, by the weight, displacement of the organ forward, by which pressure is exerted against the fundus of the bladder. Or, again, the increased weight produced by inflammatory conditions causes relaxation of the pelvic ligaments and consequent displacement of the uterus downward and backward, while the body is bent upon the cervix. This bending may take place forward, backward, or laterally.

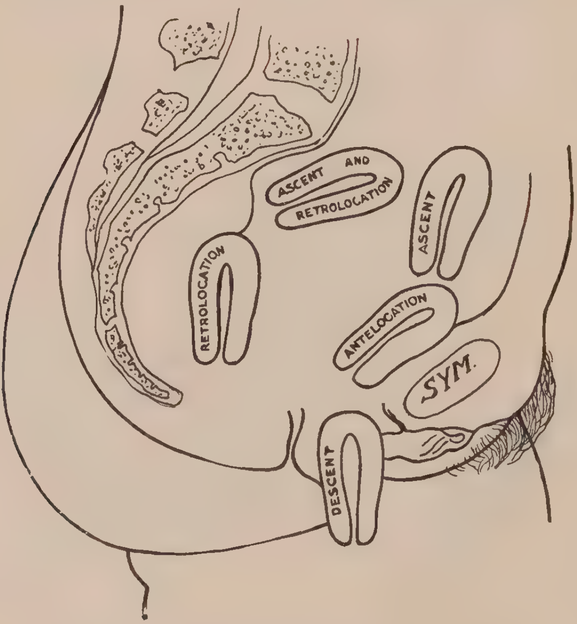


FIG. 360.—Scheme of Dislocated Uteri. (*Dudley.*)

3. The presence of inflammatory material in the cellular tissue and in the structures surrounding the uterus causes its displacement by the volume of exudation, and subsequent displacement in the opposite direction takes place by the resulting inflammatory contraction. The uterus may be displaced as a whole, although it still remains parallel to its former axis, causing a change of location; or, again, it may be turned upon its axis forward, backward, or laterally; may be bent upon its own axis; may be depressed downward; and may undergo torsion.

4. The presence of growths, either of uterine or external origin.

Classification of Displacements. As may be inferred from what has been stated in the previous section, the uterus is capable of displacement upward, downward, backward, forward, and laterally, or of being twisted upon its axis. Upward displacement is known as ascent; downward, as descensus or prolapsus uteri. (Fig. 360.) The location of the uterus is subject to change: thus, when it is situated toward the back part of the pelvis, hugging closely the hollow of the sacrum, it is known as a retrolocation; close to the symphysis pubis, as an antelocation; and toward one or the other side of the pelvis, as a dextro- or sinistro-location. When the direction of the axis of the organ is changed, it is known as a version; with the fundus well forward, it is an anteversion; the fundus turned backward, a retroversion; and toward either one or the other side, a dextro- or sinistro-version. The organ may be bent upon its axis, in which event the cervix and fundus approach each other. This bending may take place forward, backward, or laterally, giving rise to the terms anteflexion, retroflexion, and dextro- and sinistro-flexion. Finally, it may be twisted upon itself, producing a torsion.

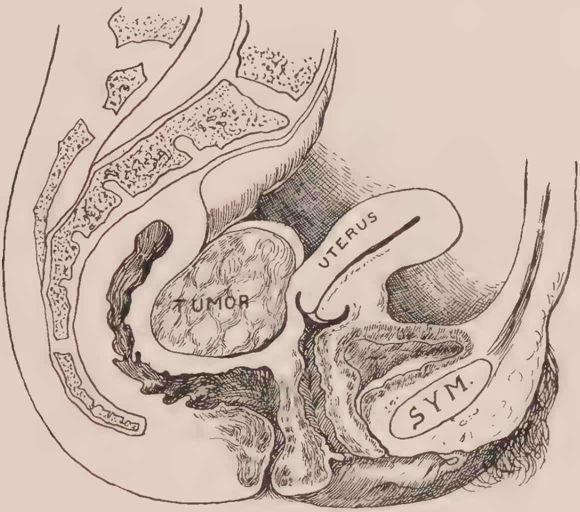


FIG. 361.—Uterus Pushed up by Tumor in Douglas' Pouch.

253. Ascent is the least frequent form of displacement. Those conditions which increase the weight of the organ, naturally, by force of gravity, depress it. It is only when the uterus has attained a size so great that it is no longer accommodated within the pelvis that ascent occurs. This is recognized as a physiologic ascent in pregnancy, and occurs after the fourth month, when the uterus becomes so large that it can no longer be retained within the pelvis, and rests upon the brim. A similar state develops when fibroid growths are situated in the organ and become large. (Fig. 361.) The uterus is drawn or pushed up by growths which may have developed in the pelvis and become adherent to it. As they increase in size and rise out of the pelvis, they drag or push the uterus up with them. Ovarian tumors, extra-uterine pregnancy, extensive pelvic exudation, hematocele, and retro-uterine growths may bring about an elevation of the uterus.

Diagnosis. Elevation of the uterus may be determined by digital examination. The cervix is absent from its usual position in the vagina. Frequently it is so elevated as to be reached with difficulty behind or even above the symphysis. Often a growth or mass fills the pelvis, over which the cervix cannot be reached. Sometimes greater difficulty is experienced in determining the condition which has caused the displacement, and this is more important than the treatment, which is entirely dependent upon the cause producing the displacement.

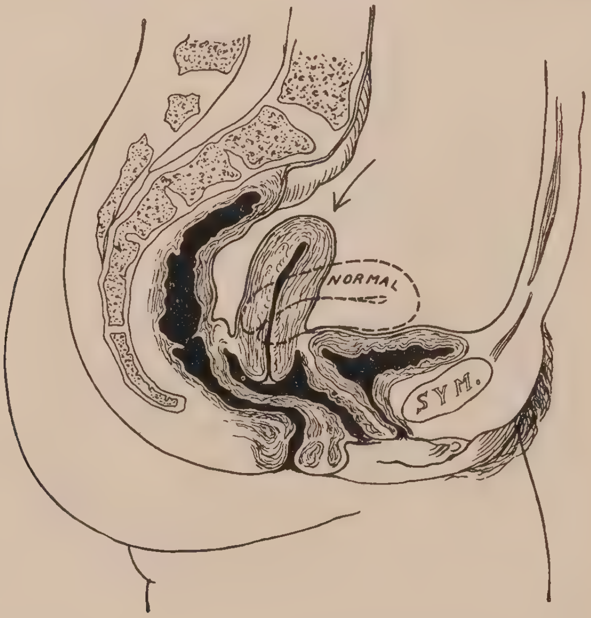


FIG. 362.—Uterovaginal Prolapse.

254. **Descent, or Prolapsus,** of the uterus varies in degree. By this term is understood a downward displacement of the organ, which is generally associated with retroversion, so that often retroversion is considered as the first degree of prolapsus. The uterus is situated at a lower level with the os directed in the axis of the vagina. The second degree of prolapsus is when a portion of the organ protrudes through the vulvar orifice, and the third degree when the entire uterus is outside of the vulva. This term includes a partial or complete prolapsus or inversion of the vagina. Prolapsus also may be complete and incomplete, according to the situation of the uterus. When the organ still is situated within the vagina or only a portion protrudes from the vulva, prolapsus is incomplete;

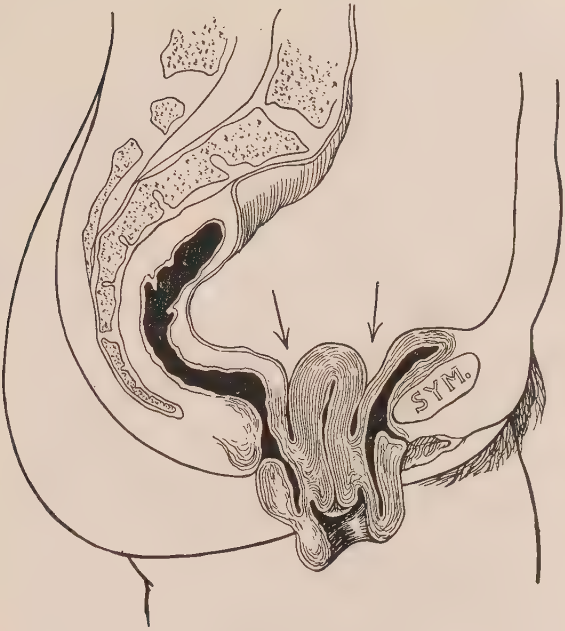


FIG. 363.—Vagino-uterine Prolapsus.

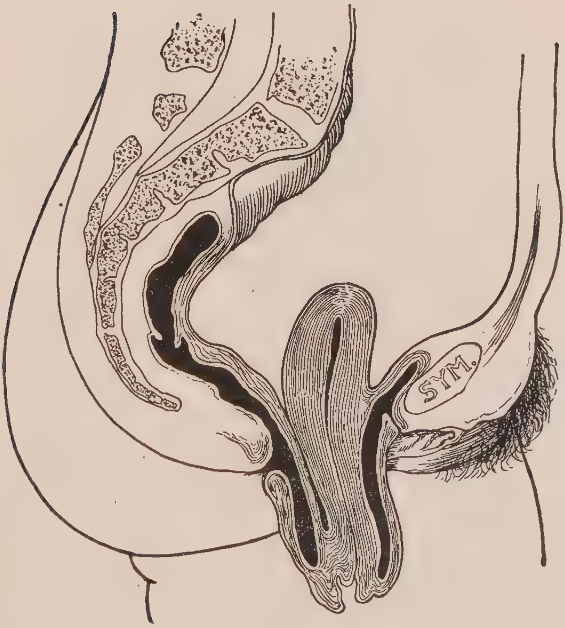


FIG. 364.—Vagino-uterine Prolapsus with Hypertrophic Elongation of the Cervix.

but when the entire uterus is external to the vulva, prolapsus is complete. The term procidentia is also applied to prolapsus, but only when the entire uterus is external. Prolapsus is further divided into three varieties, according to the relation of the uterus to the vagina.

(1) It is called uterovaginal prolapsus (Fig. 362) when the uterus is extruded through the vagina with only partial inversion of the latter; (2) vagino-uterine prolapsus when the prolapsus begins in the vaginal walls, and more or less extensive protrusion of the vagina precedes the uterine prolapse. (Figs. 363 and 366.) The prolapsus of the uterus may be incomplete while the vagina is inverted, and a hypertrophic elongation of the cervix exists. (Figs. 364 and 365.) (3) Pseudo-prolapsus is a condition in which a large portion of the cervix projects into or through the vulva, while the fundus retains its normal position and the vaginal walls are unaffected (Figs. 367 and 368). In the latter case the hypertrophic elongation takes place in the vaginal portion of the cervix.

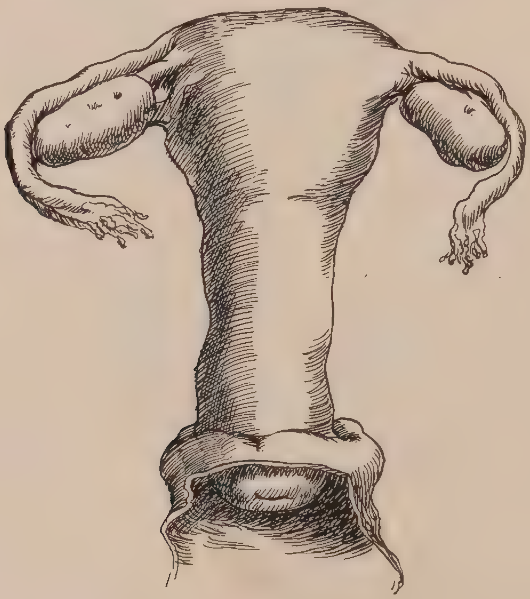


FIG. 365.—Uterus Detached, Showing Hypertrophic Elongation of the Cervix.

Etiology. The causes of prolapsus may be classified under three heads: first, decreased support; second, increased weight; third, increased intra-abdominal pressure. These conditions can exert their influence separately, but usually they act in conjunction. Decreased support is characteristic of individuals who have given birth to one or more children, and in whom the pelvic structures have been injured during the process of parturition. Laceration of the perineum or removal of the support of the posterior segment of the pelvic floor permits a protrusion of the anterior wall of the vagina and the bladder during the distention of the latter.

This protrusion of the anterior segment of the pelvic floor, because of the close attachment of the bladder to the cervix, drags upon the latter, and, unless the uterus is fixed by firm ligaments or inflammatory adhesions, the entire organ is gradually brought into the axis of the vagina, with its fundus thrown backward, and the intra-abdominal pressure will subsequently be directed upon it or its anterior surface. The decreased support to the posterior wall of the vagina removes antagonistic action of the sphincter and straining at stool, coughing, or lifting, causes protrusion of this segment with the rectum, and the cervix is drawn upon by both the anterior and posterior vaginal walls. Decreased support may exist in women who have not given birth to children, where, owing to want of normal muscular development, to ill health, or to too straight a sacrum, the support is lessened and the muscles of the pelvic floor are greatly relaxed. If, in such cases, intra-abdominal pressure is increased, extensive displacement results. Prolapsus may thus be produced in the unmarried. In complete laceration which extends through the sphincter, prolapsus is less likely to occur. In marked relaxation and want of pelvic support, which have resulted from lesions of parturition, the tendency to prolapse is increased by enlargement of the uterus or by failure to complete the process of involution. The uterus remains heavy, so that these two forces, decreased support and increased weight, acting in conjunction, lead to descent. It is true, we may have prolapsus when the uterus is small.

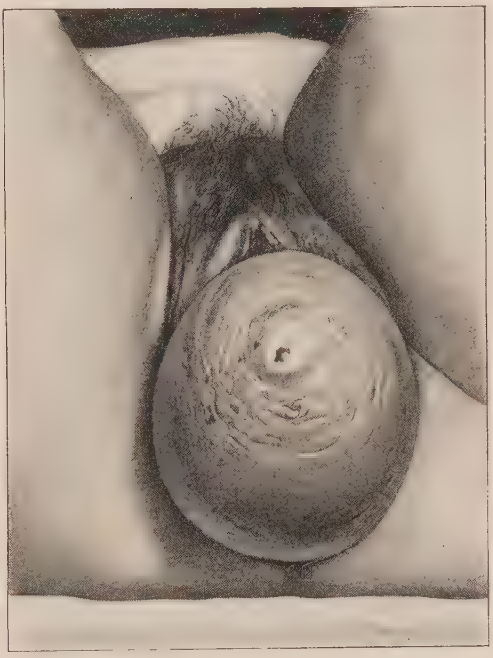


FIG. 366.—Vulvar Appearance of Vagino-uterine Prolapsus.

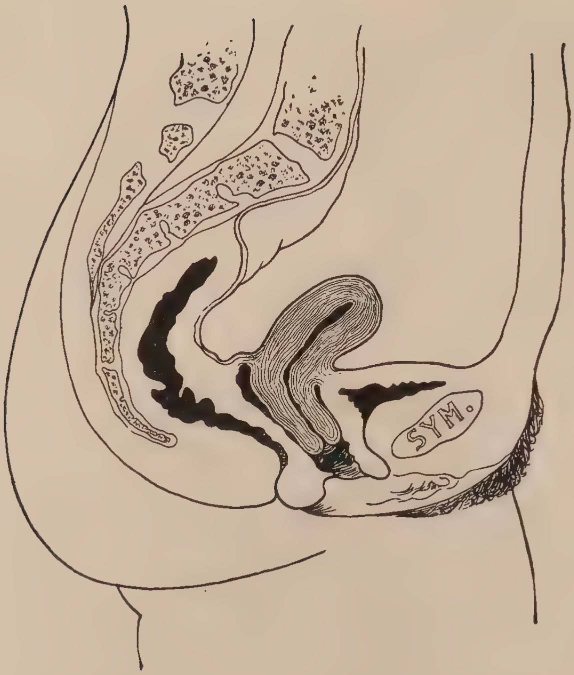


FIG. 367.—Pseudoprolapsus. Cervix Within the Vagina.

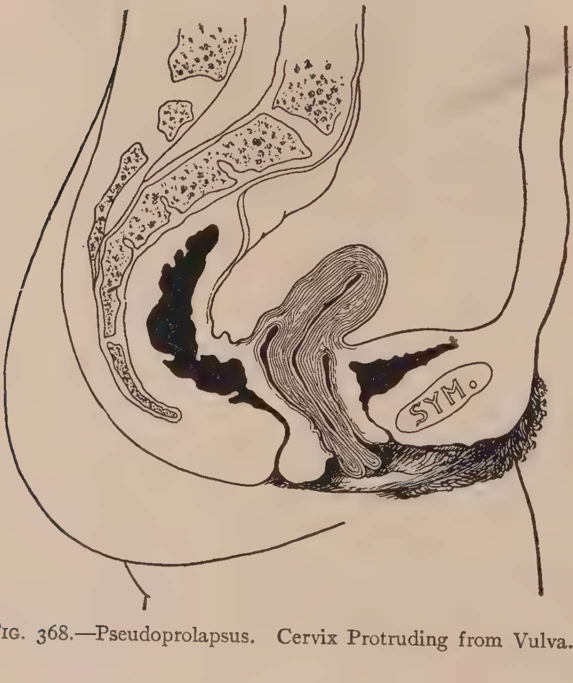


FIG. 368.—Pseudoprolapsus. Cervix Protruding from Vulva.

When, subsequent to the climacteric, the patient loses flesh, the absorption of the fatty cushion decreases the amount of support, and, with enfeebled muscular action, permits a small uterus to be driven through the pelvis. This is a cause of prolapsus in the aged. Increased intra-abdominal pressure may arise from want of proper hygiene in clothing. Tight corsets and heavy skirts fastened about the waist afford insufficient room in the abdomen for the viscera, which are driven downward into the pelvis. Neglect to evacuate the bowels and the bladder increases the tendency to displacements. Prolapsus is favored by straining at stool, by lifting and carrying heavy weights. Not infrequently a patient will give a history of having lifted a weight or of violent straining, after which a protrusion was noticed at the vulvar orifice. In such cases the condition has existed for some time, and generally has been aggravated only at the time of extra effort. The presence of growths within the abdominal cavity—fibroid tumors, ovarian cysts—which press upon the uterus may force it down. In relaxation of the pelvic floor it is not unusual to observe a prolapsus of the uterus, which has been produced by the increased intra-abdominal pressure incident to the presence of a new-growth.

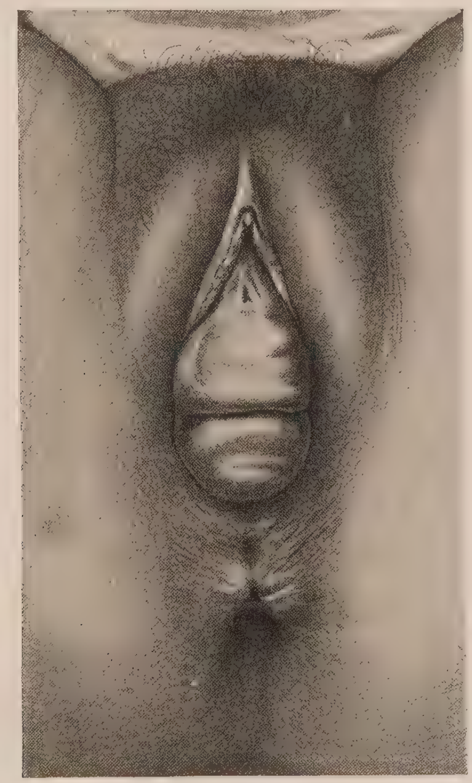


FIG. 369.—Anterior and Posterior Colpocele.

Symptoms. In the early stages of prolapsus of the uterus there are no characteristic symptoms. The patient complains of a sensation of weight, pressure, discomfort in the bladder, a feeling of burning in the rectum, and dragging sensation while walking or standing—all of which may be associated with other conditions. As the prolapsus progresses, the patient will notice a protrusion from the vulvar orifice, which is increased by straining and lifting. As this protrusion increases, the close association of the bladder with the cervical wall causes the uterus to be dragged down. The bladder, with exceedingly rare exceptions, accompanies the displacement. Occasionally, however, the peritoneal fold may be driven down between the bladder and the uterus, and a prolapsus thus occur without the bladder being associated with it. With the continuation of the prolapse the anterior wall becomes more and more everted, and, not infrequently, forms a considerable-sized tumor, which projects anteriorly, is increased by straining, and forms a tumor with a smooth, globular surface.

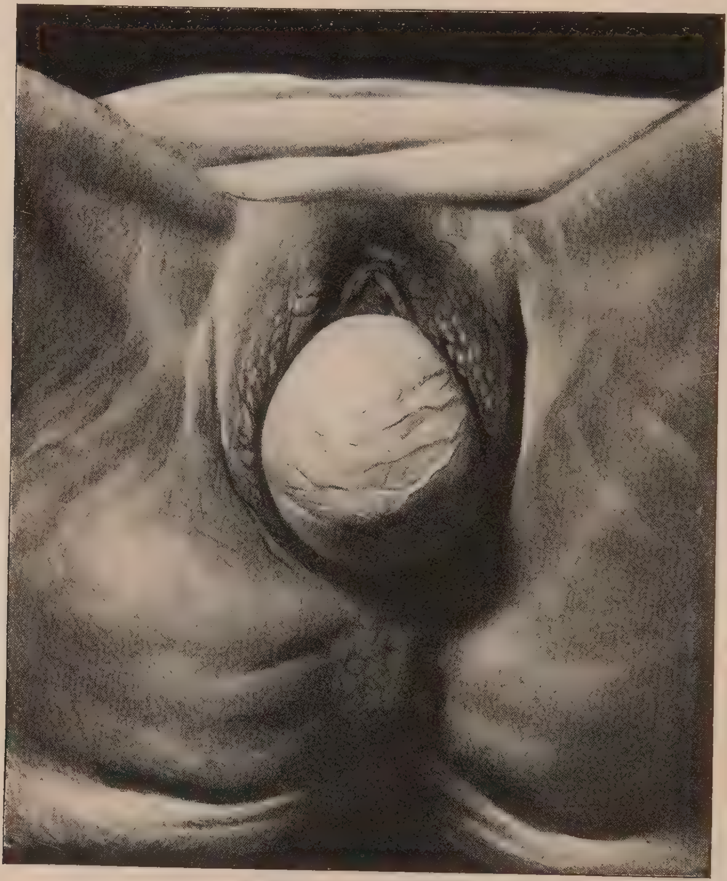


FIG. 370.—Cystocele.

This protrusion of the anterior vaginal wall and bladder is known as a cystocele. (Fig. 369.) The posterior wall of the vagina may be likewise protruded, though less frequently than the anterior. In cases of inversion of the vagina the posterior wall is generally associated, although even then not to the same degree as the anterior. The posterior protrusion is known as a rectocele. The uterus is separated from the rectum by a prolongation of the peritoneum which extends below the rectum on the posterior wall of the vagina. In the inversion of the posterior wall of the vagina to form a rectocele, the intestine may or may not be associated with it. Occasionally the want of support of the anterior rectal wall permits it to be pushed downward, and form a diverticulum considerably below the anus, which renders the evacuation of the bowel contents difficult, at times impossible, unless the protrusion is pushed up with the hand, when the scybalous masses situated in the pouch can be extruded. In complete vaginal prolapsus with the formation of an extensive cystocele a portion of the bladder is situated below the level of the internal orifice of the urethra, and as this protrusion increases, the bladder is incompletely evacuated. The retained urine with mucus in this reservoir undergoes decomposition, form-

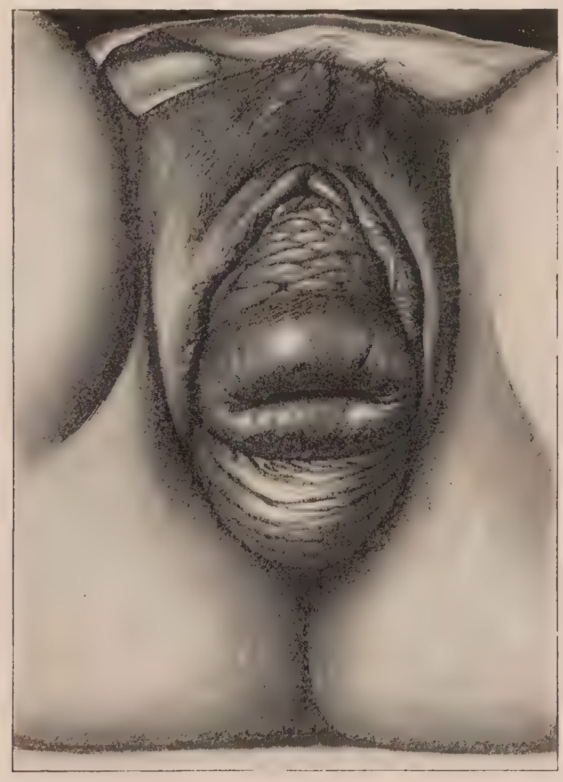


FIG. 371.—Prolapsus with both Rectocele and Cystocele.

ing an ammoniacal urine, which irritates the mucous membrane of the bladder and produces a cystitis. In this diverticulum, with a plug of mucus as a nucleus, a calculus of considerable size can form; indeed, one weighing an ounce has been found in such a sulcus. With the protrusion the distress of the patient is greatly increased, because of the bladder irritation and the friction of the protruding tumor against the clothing and limbs of the patient. The urethra, instead of passing upward and backward as in the normal situation, passes backward—even downward. The protruded vagina in a complete prolapsus may form a large tumor extending half-way to the knees, in which tumor is situated a portion of the bladder, the uterus, ovaries, tubes, and prolapsed intestines—an extensive hernia. (Fig. 372.) The mucous membrane of the vagina loses its moistened, reddish appearance, and instead becomes pale, thickened, and covered with flakes of epithelium, and resembles the appearance of the skin. Bathed with urine and fecal matter, irritated by the clothing and by friction against the limbs, and congested from the decubitus, ulceration is produced upon the external os and upon the sides of the tumor, which, at times, causes extensive loss of structure and adds greatly to the discomfort of the patient. In the early stage of the displacement the menses are increased, possibly irregular, and occur at shorter intervals. Leukorrheal discharge is present, often profuse, as a result of the congestion. As the prolapsus becomes more extensive and approaches nearer to complete prolapsus, menstruation is likely to be decreased and the leukorrheal discharge disappears. The displacement does not necessarily interfere with conception, as pregnancy has often occurred with complete prolapsus; but in the later stages the patient is more likely to be sterile.

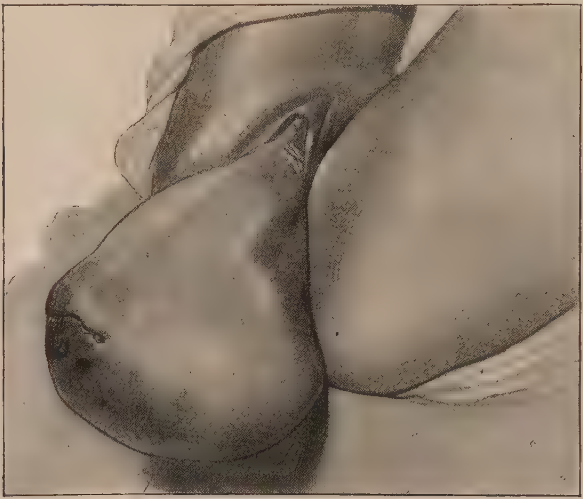


FIG. 372.—Irreducible Prolapsus. The Tumor Contained Uterus and a Large Pyosalpinx. Ulceration of Cervix.

Diagnosis. The patient considers every protrusion from the vulva to be a prolapsus or falling of the womb. The diagnosis would seem self-evident, but it must be conceded that not every such protrusion is necessarily a prolapse of the uterus, and it is important to determine the degree, the form of prolapsus, and the structures involved. This knowledge is obtained by inspection, while the patient is directed to increase the displacement by straining and bearing down. It is further confirmed by touch. A cystocele is a protrusion from the anterior part of the vulva, continuous with the urethra and anterior wall. It is the most frequent protrusion from the vulva, and may be accompanied in part or wholly by the uterus. In cystocele the finger enters the vagina behind the protruding mass, which generally can be replaced with ease. The cervix accompanying it will be situated at its posterior surface. A protrusion of the posterior vaginal wall is recognized by its continuity with the perineum, and the finger enters the vagina in front of it. Considerable protrusion of the vaginal walls may occur without much, if any, displacement of the uterus. The degree of displacement of the anterior and posterior vaginal walls is recognized by the introduction of the finger around the uterus. Thus, the cervix may protrude from the vulva without there being any shorten-

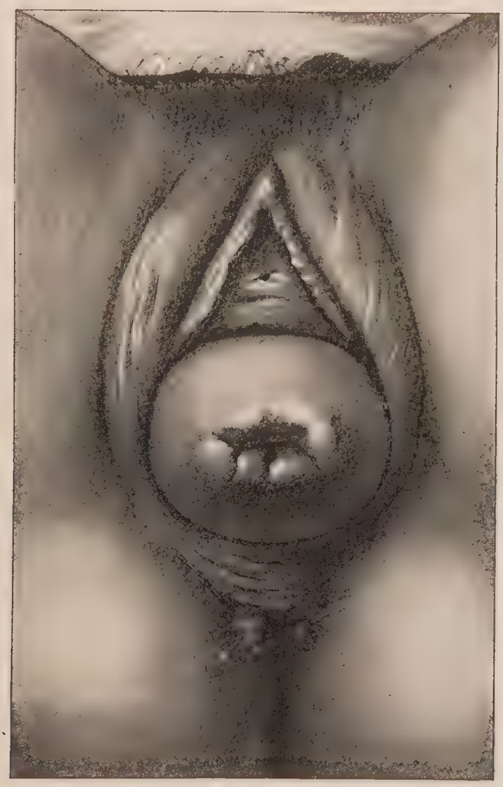


FIG. 373.—Prolapsus without Protrusion of Vaginal Walls.

ing of the posterior, and but slight shortening of the anterior vaginal wall. With inversion, or complete prolapse of the vagina (Fig. 371), the summit of the protrusion is occupied by the cervix, which may appear as a normal-sized opening, or external os; or, when laceration of the cervix has occurred, the lips may be widely everted, and show an irritated cervical mucous membrane. When prolapsus is complete, the uterus is situated in the tumor, external to the vulva, generally in the position of retroversion or retroflexion; it is rarely anteflexed. The uterovaginal form of prolapsus is determined from the vagino-uterine variety by the lessened involvement or association of the vagina with the protrusion. In the uterovaginal form (Fig. 373) the uterus is driven through the vagina, drags the upper part with it, and finally results in partial inversion of the canal. When prolapsus is complete, the uterus is likely to be small and its cavity short. In the vagino-uterine variety the prolapse begins at the lower segment of the vagina by a rolling outward of the anterior and posterior walls. The thickened and everted vaginal walls drag upon the cervix, and lead to displacement of the uterus; or, where the fundus is fixed by the condition of its ligaments or by inflammatory disorders, the cervix is drawn out, and causes a very marked elongation of the uterus. This condition is determined by placing the fingers of one hand in front of, and those of the other hand behind, the protruding mass. This also reveals the situation of the fundus of the uterus. (Fig. 374.) If the protruding tumor is grasped between the thumb and fingers of one hand

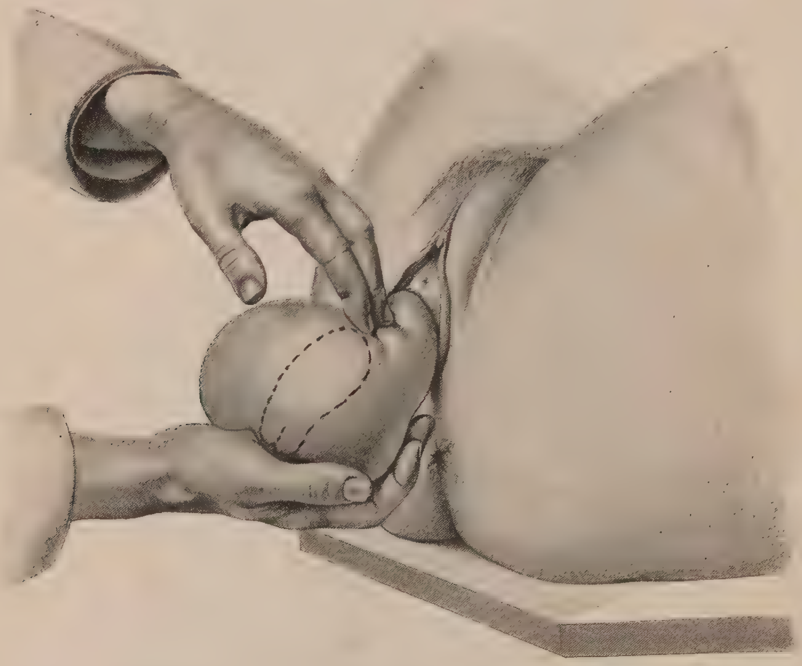


FIG. 374.—Determination of the Position of the Uterus by Bimanual Palpation.

the fingers will distinguish the uterus outside the vulva, or the cord-like cervix protruding into the vagina, when hypertrophic elongation of the cervix exists. (Fig. 375.) The situation of the fundus can be recognized still further by the introduction of the finger into the rectum. By dragging upon the cervix with a tenaculum while passing the finger into the rectum the attenuation of the neck is determined, and the situation of the fundus is recognized. (Fig. 376.) In pseudoprolapsus the fundus is but little displaced from its normal situation. There is a protruding mass from the vulvar orifice, and the introduction of the finger into the vagina shows that the vaginal walls are not displaced. Elongation has taken place in that portion of the cervix which is situated below the vaginal attachments. It generally results from enlargement and increased weight of the cervix. The anterior segment of the vagina is attached to the cervix at a lower level than the posterior. Occasionally, we find a protrusion of the anterior wall of the vagina, with the cervix at its posterior surface, while the introduction of the finger into the vagina shows that the posterior vaginal wall is not displaced. (Fig. 377.) In other words, the elongation has occurred in that portion of the cervix situated between the attachment of the anterior and the posterior vaginal walls.

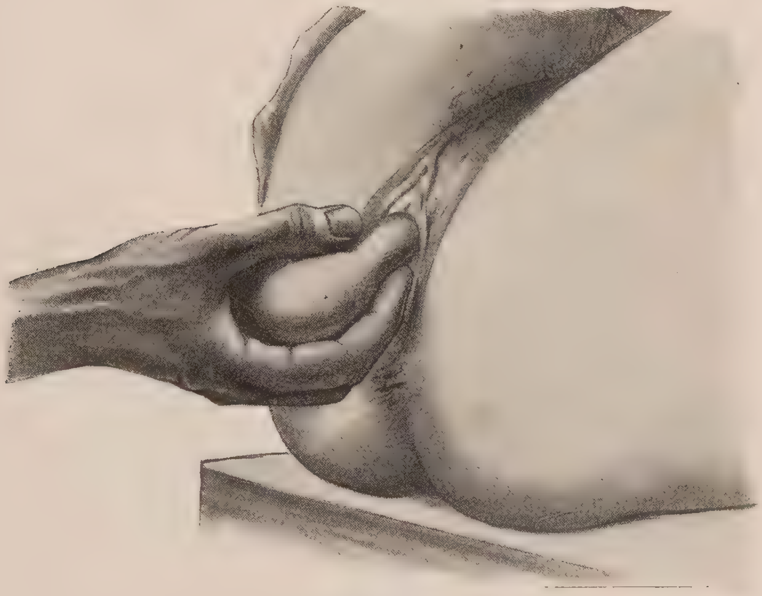


FIG. 375.—Recognition of Uterus with Thumb and Fingers of One Hand.

In considering the differential diagnosis we must concede the possibility of the protrusion having arisen from a cyst in the anterior wall of the vagina, a hernial protrusion through the posterior fornix, a fibroid polypus, and an inversion of the uterus, associated with inversion of the vagina. Cyst of the vagina is recognized by bimanual palpation. A catheter or sound introduced into the bladder, and a finger into the vagina, will reveal an abnormal thickness of the anterior wall, and readily disclose the character of the condition. The bimanual examination can reveal a fibroid polypus protruding from the orifice of the cervix by a more or less distinct pedicle. Traction upon the tumor and the introduction of a finger into the rectum will disclose the position of the uterus. Displacement of the rectum is not generally associated with prolapsus of the vaginal walls, and, when it exists, is less intimately connected. Inversion of the uterus is recognized by a protruding tumor, which does not present an external os, is more sensitive and under careful examination shows the orifices of the Fallopian tubes. It is a globular, well-shaped tumor, which can lead to an inversion of the vagina in which the relation of the cervix to the tumor and the vagina is readily determined.

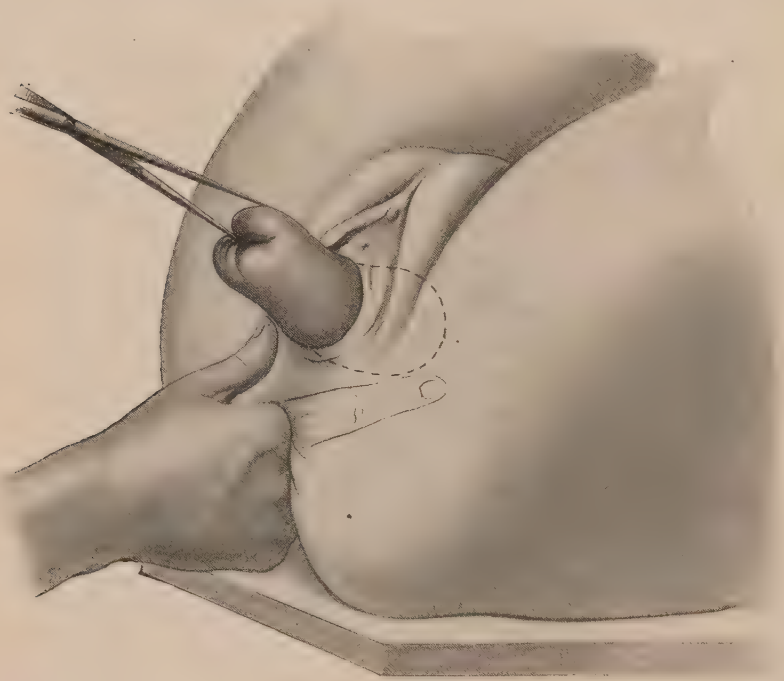


FIG. 376.—Diagnosis of Position of the Uterine Body by Rectal Touch.

Enterocele, or hernia through the posterior fornix of the vagina, is a rare condition, although I have seen two such cases in which the hernia extended to the vulva. (Fig. 378.) The tumor is generally more elastic and is greatly distended. The absence of the uterus, in association with it, is recognized. On reduction of the hernia the opening into the posterior fornix, through which it had passed, is readily recognized.

Prognosis. The results of treatment must depend upon the stage of development, the existing complications, and the manner of life the patient is required to live. The earlier the displacement comes under observation, the less radical will be the means required to maintain the organ in its replaced position. When both uterus and vagina are prolapsed, changes have taken place which are beyond our skill to restore to the previous condition. While much can be done for the comfort

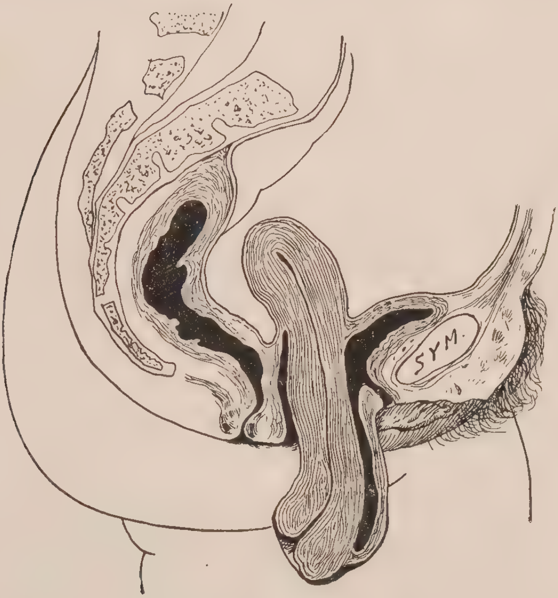


FIG. 377.—Hypertrophic Elongation of the Cervix. Anterior Vagina Everted, while Posterior Retains Its Normal Position.

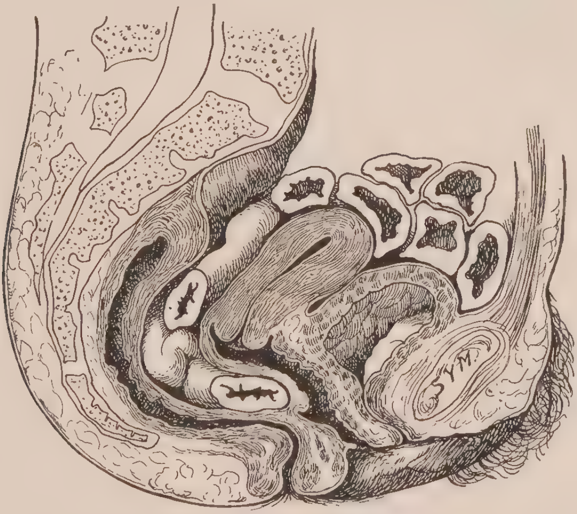


FIG. 378.—Enterocele through the Posterior Vaginal Fornix.

of the patient in all cases, in some, however, it may be necessary to sacrifice the uterus and part of the vagina. The irritation to which the vagina is subjected will sometimes lead to the development of an epithelioma. (Fig. 379.) Not infrequently we will find gravity sores and extensive ulcerations as a result of friction and interference with the circulation. The restoration and maintenance of the pelvic organs in their proper place will depend upon the complications which may be associated with the displacements. The most frequent complication is the sequel of inflammatory changes, in which the displaced organs are more or less fixed by extensive exudation and adhesions. In procidentia the protruding sac or hernia, in addition to the uterus and part of the bladder, is likely to contain the ovaries and tubes, and even a large portion of the large and small intestines. Inflammatory changes in such a condition may lead to an irreducible hernia, which must necessarily add very much to the distress and discomfort of the patient. Such a patient can neither sit nor stand with comfort. In one patient (Fig. 372) a large protruding sac contained the uterus, ovaries and tubes. The latter having become infected resulted in the formation of a considerable abscess. Fortunately, the condition was irreducible. Otherwise the reduction of such a mass into the abdominal cavity might readily have resulted in rupture of the tube and general infection of the peritoneum. In one instance I was obliged to remove the uterus because of a partial necrosis of its structure. Ordinarily, hysterectomy would not be the operation of election, as removal of the uterus leaves an open space, difficult to close thoroughly, and favors the subsequent development of a vaginal hernia, which is difficult to remedy. With the retention of the uterus and its proper anchorage in the pelvis it serves as a plug and obstruction to the redevelopment of a hernia. It is self-evident that the patient who is enabled to live a luxurious life need not be subjected to the same treatment as the woman who must maintain herself, and, possibly, the members of her family, by laborious industry. The former, by rest and proper hygiene, may be

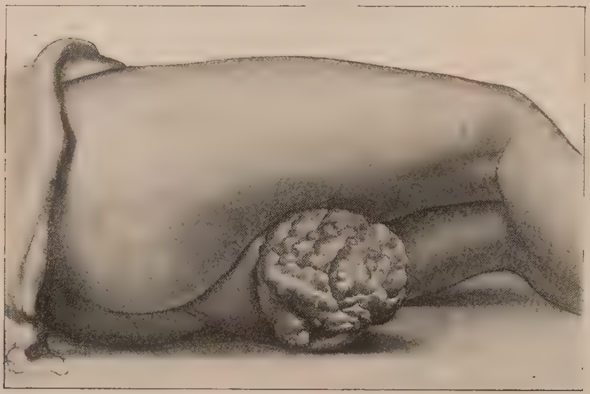


FIG. 379.—Vagino-uterine Prolapse Complicated by Proliferating Epithelioma.

able to prevent the development of the prolapsus, consequently an operative procedure may be delayed or mechanical means employed to overcome the condition, while the woman who must earn her living at the washtub or by continuous maintenance of the upright position will require operative interference in order to prevent a more extensive displacement.

Treatment. The treatment of prolapsus uteri must necessarily depend upon the extent of the displacement, the involvement of the vagina, the distention of the vaginal orifice, and the age and physical condition of the patient. The most important treatment is prophylaxis. This consists in the careful management of the woman during labor and the puerperium; the early repair of lacerations of the cervix and perineum; the examination of the patient subsequent to her delivery to determine the condition and situation of the uterus. The advent of inflammatory conditions should be followed by judicious treatment, such as the employment of hot vaginal douches; cold applications over the abdomen; rest in bed; depletion of the uterus; and, where endometritis exists, the use of the curet. A heavy uterus should be sustained by tampons or a pessary, until the process of involution has been completed. The treatment of prolapsus may be hygienic, mechanical, or operative.

Hygienic treatment comprises the wearing of proper clothing. A woman with a tendency to prolapsus of the uterus should not have her abdomen constricted. The increase of the intra-abdominal pressure necessarily aggravates the displacement; consequently, the clothing should be loose. Skirts should be suspended from the shoulders rather than from the waist; the bowels should be kept regular and all straining at stool avoided; lifting and carrying heavy weights should not be undertaken; the patient should frequently assume the knee-chest position, and, while in this attitude, separate the vulva in order that the air may enter and magnify the influence of gravity in restoring the displaced organs. This position should be particularly assumed for several minutes as a last act before retiring, and patients should assume the lateral or prone position rather than the recumbent.

Mechanical treatment of prolapsus consists: 1, in the reduction of the displaced uterus or its return to a normal position; 2, in the employment of means to insure that this position will be maintained. The first step, then, in treatment is to replace the displaced organs. Ordinarily this is not difficult, as the increased size of the vaginal canal readily permits the organ to be carried upward to its proper place. Where the displacement, however, is complicated by inflammation with extensive exudation into the pelvis, it may result in matting together the uterus, ovaries, and tubes with knuckles of intestine and portions of omentum. Such a condition will render the restoration of the organs exceedingly difficult, if not impossible, without resort to operative interference. Sometimes the displaced uterus, from passive congestion or edema, will become so large and engorged that it cannot be replaced through the pelvic canal. This is particularly apt to occur in those cases in which the prolapse is complete and the uterus and vagina have been subjected to friction against the clothing, causing the formation of gravity sores, and swelling to such an extent that the mass is rendered too large to be returned through the pelvis. Such a tumor may sometimes be reduced in size by the application of an elastic bandage, or by keeping the patient perfectly quiet in bed, with the pelvis somewhat elevated, and cold applications applied to the swollen structures. Cloths wet with lead-water and laudanum and covered with oiled silk, over which an ice-bag is applied, will frequently be effective in relieving the engorgement, and after a few days' treatment will result in such a decrease in size as to permit the parts to be reduced. The organ can be replaced with much greater ease by placing the patient in the genupectoral position. While the patient is in this position the tumor can be drawn down, compressed with the fingers, and gradually pushed up to its normal site within the pelvis. A mass too large to permit of its replacement with the patient in the dorsal position can generally be returned while in the knee-chest posture. When the uterus is fixed by inflammatory exudate, the patient should be put to bed, the parts subjected to pelvic massage, and in the intervals the uterus supported as high as possible by tampons of cotton and gauze, or, probably still better, lamb's wool saturated with medicinal agents, in which glycerin shall form an essential part. This treatment should be alternated with hot vaginal douches. Inflammatory adhesions may also be overcome by the employment of continuous weight or pressure. This is rather difficult to apply within the pelvis, because of its being the most dependent portion of the trunk. The patient can be placed on her side, with the pelvis somewhat elevated. Pressure is then obtained by introducing into the vagina a small rubber bag containing mercury. The continued pressure thus directed upon the surface will promote the absorption of the exudation, and, by change of position the uterus can be worked gradually free from the exudate. Thus, tampons, douches, massage and pressure should be employed until the uterus becomes freely movable and its reposition is accomplished. This, of course, is desirable as a preliminary to the employment of such a mechanical support as the pessary. In cases of prolapsus the pessary acts by so distending the upper part of the vagina that the levator ani and the muscles of the pelvic floor form a support for the instrument and thus prevent displacement. Consequently it is necessary that the pessary shall be of sufficient size to accomplish this distention. (Sec. 112.)

In the use of many of the pessaries, however, it is absolutely necessary that the pelvic floor shall afford a point of resistance to the intra-abdominal pressure. When the pelvic floor has been lost, or where the prolapsus is of the vagino-uterine variety, the pessary, having no point of resistance, is at once extruded when the patient makes a straining effort, or even upon standing. In such cases a pessary may be employed with an external support. Such an instrument, however, is exceedingly uncomfortable; the stem and straps are irritating to the delicate external surfaces. The cup may cause ulceration and abrasion of the cervix and vagina. The employment of a pessary in prolapsus can be only palliative. It has no power to restore function to the part. A patient came under my observation who had worn a pessary for twenty-six years. This had produced such marked abrasion and irritation of the vagina that granulations had sprung up which enveloped the greater part of the instrument with new tissue. The pessary was cut with bone-pliers, and each half removed separately, leaving undisturbed the mass of cicatricial tissue by which the uterus was subsequently supported. I have seen, in several instances, the bulb or glass-ball pessary worn for a long period of time, until it resulted in cicatricial changes in the vagina, which formed the support for the atrophied uterus. The maintenance of the uterus by the establishment of cicatricial tissue has been attempted by the injection of quinin and other irritating materials into the broad ligaments. This was done in order to establish a cellular inflammation, which should cause such contraction of the connective tissue as to retain the uterus in position. Such a plan of treatment, however, is attended with too much danger to justify its employment.

Operative treatment affords the only means which can be considered radical, or as giving hope for the restoration of the structures and their maintenance in normal position. In the employment of such measures I wish to direct attention to the three causes which have been assigned for the development of prolapsus. These are, increased weight of the uterus, decreased pelvic support, and increased intra-abdominal pressure. The malposed uterus is rendered heavy by a condition of subinvolution or chronic inflammation, which has in part resulted from obstruction to its circulation. Not infrequently will we find that the cervix has undergone hypertrophic elongation, and the vaginal walls are dragging upon this elongated portion of the organ. The first step, then, in the restorative process, should be the amputation of the cervix. This decreases the size of the uterus, not only by the amount of the cervix removed, but by the favorable metabolism thus engendered. The amputation may be free or the double-flap or single-flap method can be employed (Sec. 208), according to the particular pathologic condition present. In performing this operation we would suggest that the cervix be sutured with chromic catgut, as such sutures can be allowed to remain; moreover, the stretching of the newly united surfaces consequent upon the removal of sutures is thus avoided. The second indication is met by narrowing the vaginal canal and reconstructing the pelvic floor. Early in the history of gynecology various operations were devised to secure this object. Sims did a triangular denudation upon the anterior wall, the surfaces of which were united and the canal thus reconstructed. The method of freshening the surface will largely depend upon the character and form of the prolapsus. Furthermore, the maintenance of the uterus in position by narrowing the vagina will be especially applicable to the correction of the cystocele.

Cystocele is frequently a sagging of the anterior segment of the pelvic floor alone or in conjunction with the uterus and posterior segment, and operative procedure to maintain it in place must take into consideration this situation of the bladder. The portion of the bladder displaced often will be found to be below the level of the internal orifice of the urethra when a portion of the urine remains, undergoes ammoniacal fermentation and decomposition, and leads to the deposition of calculi which further aggravate and add to the distress of the patient.

Correction of the condition demands not only the contraction of the anterior vaginal wall, but the elevation and maintenance of the bladder at a higher level. Where the displacement of the bladder is not marked, an elliptical section of the relaxed vaginal wall may be removed and the edges sutured transversely (Fig. 380.) A relaxed condition of the bladder may be overcome by separating it from the cervix by blunt dissection and, as suggested by Goffe, suturing the relaxed portion high up on the anterior surface of the cervix. The operation is completed by transverse sutures of the anterior vaginal wall a portion of which may have been excised from each side. The suturing as completed is seen in Fig. 381. The folding of the bladder decreases its pressure against the reconstructed walls. The closure of the vaginal wall should begin near the cervix and the suturing extend outward, the cervix being pushed upward with the tying of each suture. This procedure secures a strong anterior segment of the pelvic floor. The line of suturing should be vertical

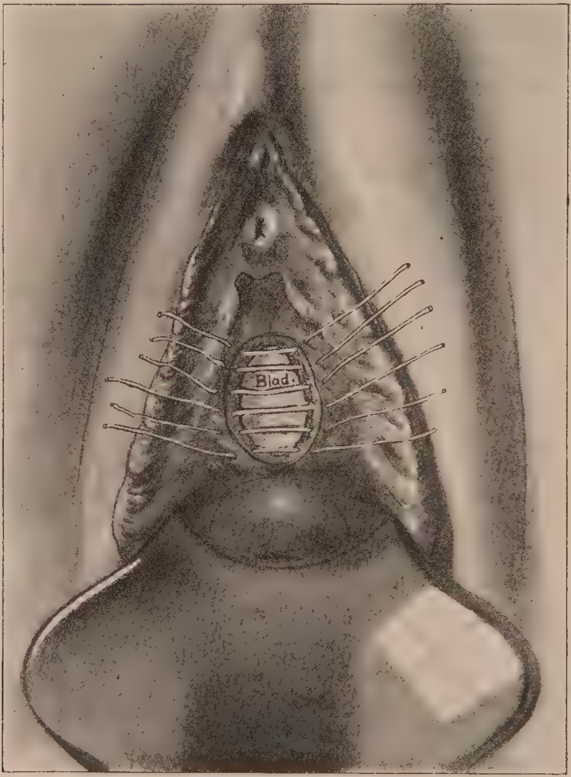


FIG. 380.—Anterior Colporrhaphy. Anterior Vaginal Wall Removed.

and the sutures of chromic catgut. The aim of the operator should be to make a long anterior wall, to hold the cervix backward, and, consequently tilt the fundus uteri forward. In greatly relaxed vaginal walls the excision may be made circular, and the wound closed with the Stolz's suture. (Fig. 382.) This, however, contracts the vagina in every direction and, therefore, is less favorable in the majority of cases than the method of anterior colporrhaphy already described. The ordinary method of performing the operation, known as anterior colporrhaphy, consists in making a denudation which does not penetrate the entire vaginal wall. When sutured, such a denudation forms a wall of connective tissue, which is not so durable as the method we have described. Watkins controls this condition very effectively by the following procedure: The anterior vaginal wall is separated from the cervix by a semilunar incision, and is incised in the median line from the cervix to within half-an-inch of the external meatus of the urethra. The bladder is separated from the cervix by the finger covered with gauze. Where this is not accomplished readily, it often may be done more easily from the sides where the attachment is not so firm. The peritoneum when reached is

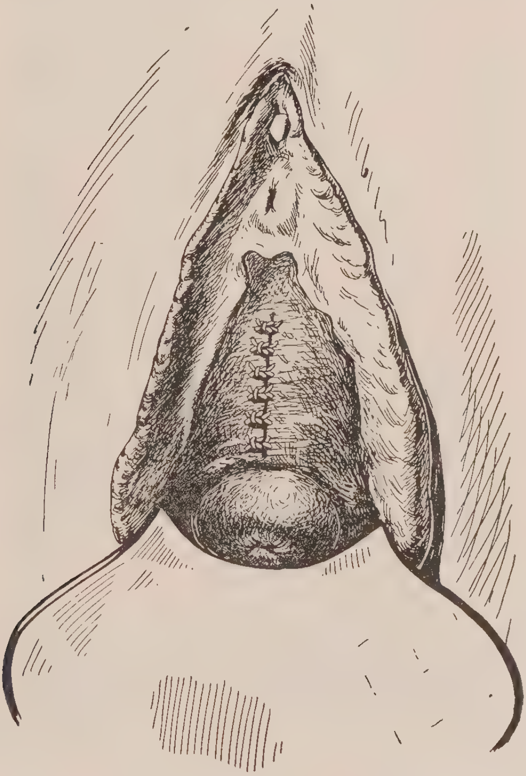


Fig. 381.—Wound Closed.

opened and the fundus turned down with the aid of bullet forceps. The peritoneum is stitched to its posterior surface and two sutures are inserted through the vaginal walls and the posterior surface of the fundus so as to carry the fundus under the bladder, care being exercised that it does not make pressure against the inner end of the urethra and thus obstruct the flow of urine. (Fig. 383.) The superfluous material in the vaginal walls is cut away and the vagina united over the uterus. (Fig. 384.) Generally the operation upon the anterior vaginal wall should be supplemented by one upon the posterior. This may be slight or extensive, according to the amount of relaxation. The restoration of the posterior segment may be accomplished by performing the operation known as the modified Garrigues-Hegar, or the operation designed by Emmet.

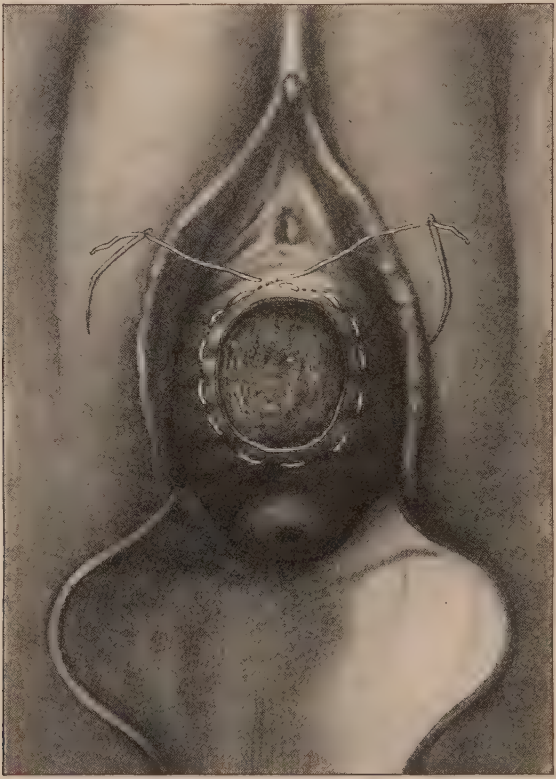


FIG. 382.—Stolz's Purse-string Suture.

While any one of a number of procedures may be followed for the restoration of the pelvic floor, the one described (Sec. 225) for laceration of the pelvic floor will prove serviceable in the majority of cases. Its great value is in the restoration of the forces antagonistic to the sphincter ani and the support given to the rectal wall. Decrease in

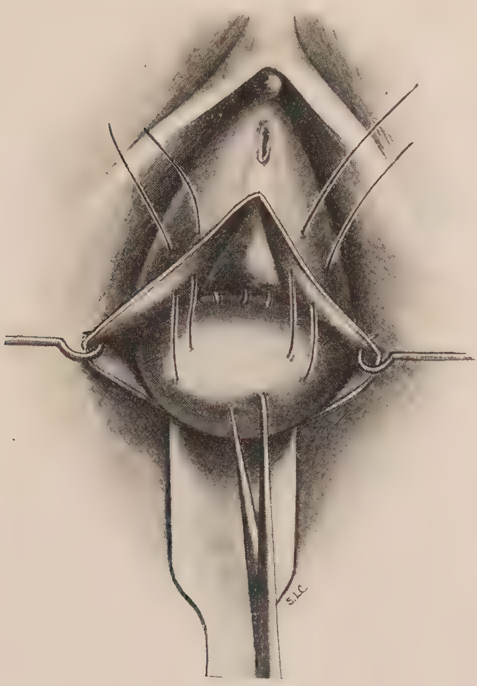


FIG. 383.—Watkin's Operation for Cystocele. Sutures inserted for Carrying the Fundus Under the Bladder.

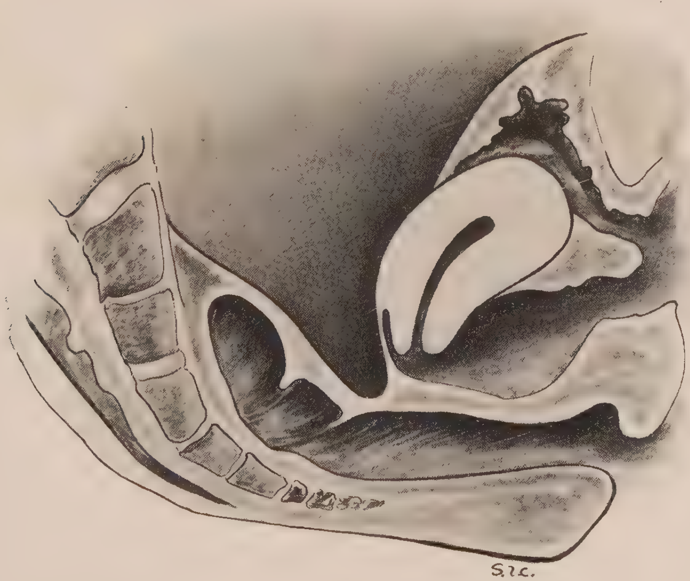


FIG. 384.—Situation of the Uterus in Completion of the Watkin's Operation.

the size of the uterus, and restoration of the pelvic floor, will, in many cases, prove effective in maintaining the uterus in its proper position. In others, however, where the uterus is large, fails to maintain its proper axis, and drops backward, the intra-abdominal pressure will tend to drive it through the newly united canal and reëstablish the hernia. It is consequently important that the uterus should be anchored within the abdomen, to prevent such an occurrence. This anchoring of the uterus may be accomplished by the operation known as ventrosuspension, or ventrofixation. The same purpose can be effected by one of the operative procedures which utilize the round ligaments, as in the Alexander, the Gilliam-Ferguson, the Ries, or other modifications, which will be described later. Of course, the aim of the operative procedure is to maintain the fundus of the uterus forward. This can be accomplished by vagino-uterine fixation or by shortening the round ligaments through the vagina. Such operations can be done in association with those upon the anterior wall of the vagina, as in the procedure we have already described. When the bladder is pushed away from the cervix, it is very easy to enter the peritoneal cavity through an anterior colpotomy and employ the opportunity thus afforded to break up adhesions, to treat ovarian and tubal disease, and to restore the uterus to its normal position. The incison through the posterior vaginal fornix is also used to shorten the uterosacral ligaments. It will readily be understood that if the cervix is carried upward and backward, the fundus will necessarily fall forward. The contraction of the uterosacral ligaments, or the tissue in which they are usually situated, is of special value in marked prolapsus, for if ventrosuspension or fixation is done, or one of the operations upon the round ligaments alone, we would have the uterus hanging and dragging upon its anchorage. Shortening the uterosacral ligaments, however, lifts up the cervix and, consequently, throws forward the fundus, thus making the uterus serve as a plug to obstruct the egress through the pelvis. Where the utero-sacral ligaments are shortened as a part of the general procedure, they should be exposed before the sutures are tied in the operation upon the anterior vaginal wall. Bovée advises that the ligaments be exposed by a vertical incision from the posterior surface back toward the rectum, which shall extend to, but not through, the peritoneum. The latter is pushed off on either side until the thickening indicating the position of the ligament can be determined. Each ligament should be seized about its middle with a hemostat and drawn downward, while traction upon the cervix is discontinued. Each loop should be transfixed by a suture which is tied and the end of the doubled ligament secured just behind the cervix, near the normal attachment of the ligament. This course applied to both ligaments results in holding the cervix at a higher level and in many cases may obviate the necessity for opening the abdomen. In anterior colporrhaphy the sutures for closing the wound should have been introduced and secured by hemostats before the incision to expose the uterosacral ligaments, and after the latter are secured, as indicated above, the former should be tied. By this course no traction is made upon sutures after they have been secured. These measures may be supplemented further by the retraction of the posterior vaginal wall or pelvic floor. When the ligaments have been secured, the vaginal incision for their exposure should be united by continuous catgut suture, leaving a vent through which gauze drainage can be employed. Freund advised in aged women, in whom the prolapsus was marked and the condition of the patient unfavorable for a radical operation, that silver wire sutures should be passed so as to form successive rings beneath the uterus. The introduction of the sutures should begin immediately beneath the cervix, so as to push up and maintain the organ at a higher level. He directed that they be drawn moderately tight and fixed by twisting; the ends are then cut off and pushed into the vesicovaginal septum. The silver wire thus secured forms successive bands or hoops around the restored vagina, which it was thought would maintain the uterus in place. My own experience, however, is that upon very slight exertion the entire condition is reëstablished. Moreover, the silver wire sutures are likely to cause irritation or possibly the formation of abscess, which will ultimately require their removal.

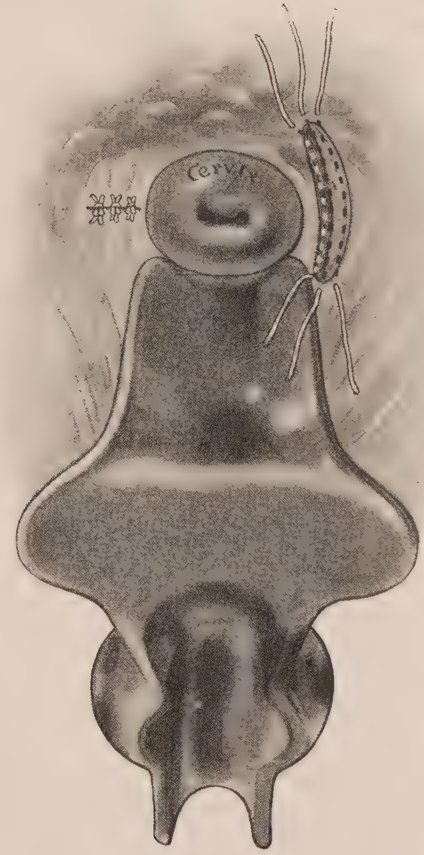


FIG. 385.—First Stage of Dudley's Bilateral Denudation of the Vaginal Walls for Prolapsus.

Attempts have been made to maintain the uterus within the pelvis by inflammatory changes in the broad ligaments. Injections of quinin hypodermatically have been employed for this purpose, but such procedures must be futile, inasmuch as they meet but a part of the required indications. Wiggins endeavored to accomplish the same by an intraperitoneal purse-string suture in each broad ligament. In prolapsus of large uteri, complicated by inflammation of the tubes and ovaries, with bands of adhesion fixing omentum or coils of intestine to the uterus and bladder and with the subsequent cicatricial changes, the preferable plan of procedure, in my judgment, is the partial or complete removal of the organ. Even so radical a procedure should be supplemented by a plastic operation upon the vagina, in order to narrow the canal and afford better support to the abdominal viscera. Such patients, even though old, bear operation fairly well. Where the condition of the uterus will permit of its retention, the organ should not be sacrificed. We have already cited reasons why hysterectomy should not be the operation of election. In hypertrophic elongation of the cervix it may be difficult, by simple amputation of the cervix and fixation of the uterus, to elongate the vagina sufficiently to prevent recurrence of the hernia. In such cases, especially where the woman has passed the climacteric, supravaginal amputation of the fundus uteri, through an abdominal incision, followed by suturing the stump, covered with peritoneum, to the broad ligaments upon each side, as advocated by Baldy, will be effective, or when the vagina is very much relaxed, we may sew the stump of the cervix directly to the abdom-

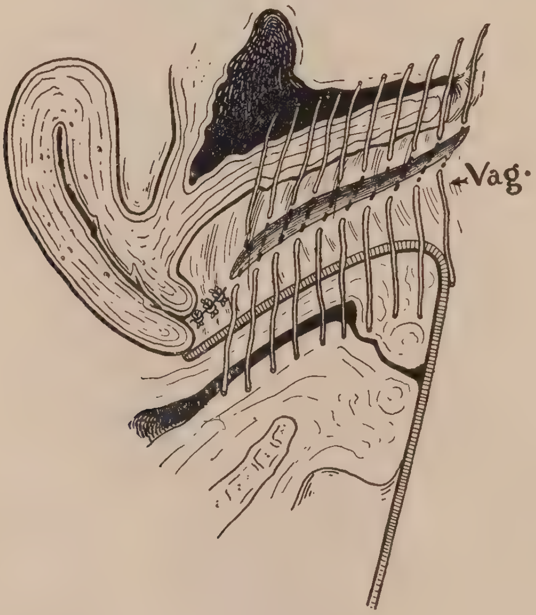


FIG. 386.—Dudley's Operation, Showing Denudation upon One Side of the Vagina.

inal parietes, as advocated by Noble. E. C. Dudley asserts that the part of the vagina most resistant to displacement is its lateral surface, and that, instead of narrowing the vagina on the anterior and posterior walls, the preferable plan of procedure would be to denude an elliptical surface upon either lateral fornix, with the long diameter anteroposterior. The edges of newly made surfaces are apposed and secured with sutures through the long diameter. From this a lateral denudation is made upon either side, in which the sutures are introduced from behind forward and from above downward, in such a way as to lift up the anterior wall of the vagina. (Figs. 385 and 386.) Even in marked cases of prolapsus sutures may be introduced so as to serve in some degree to anchor the lateral surfaces of the vagina.

255. Urethrocele. The urethra, in extensive cystocele, is generally more or less involved. As has already been recognized, the intimate connection of the bladder and urethra with the anterior vaginal wall necessitated their association in any prolapsus of the latter structure. When a segment of the bladder is situated below the internal orifice of the urethra, the upper part of the urethra, as a consequence, becomes prolapsed. The lower segment of the urethra, however, generally retains its normal situation. Occasionally we may have a protrusion from the central portion of the urethra, which forms a sac-like projection (Fig. 387) at the lower portion of the anterior wall of the vagina. This latter condition is independent of any uterine or vaginal displacement. This projection, on the introduction of a catheter, is found to be a part of the urethra. It is at times so large as to form a kind of diverticulum, over which the urine flows, without entering it, or enters it only to a limited extent. Pressure over the urethrocele causes a discharge of profuse purulent material, although pus has not previously been found in the urine. The treatment consists in dissecting out the sac, a catheter having been previously introduced as a guide. The opening in the urethra is closed

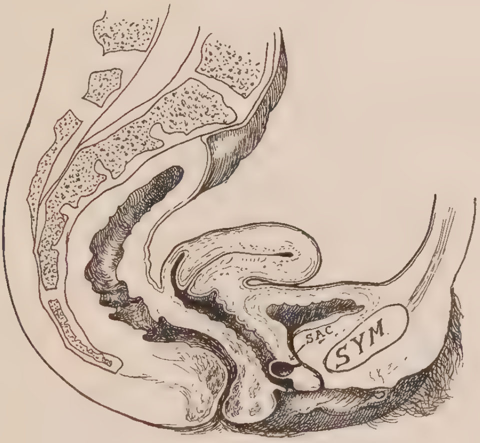


FIG. 387.—Urethrocele.

while the catheter is in place. The vaginal wall is then sutured over this wound, and the urine is subsequently evacuated through a permanent catheter for two or three days.

256. **Dislocation of the uterus** is a displacement in which there is but slight change in its axis. These dislocations may be forward, backward, or lateral. The organ is more or less fixed in the abnormal position by inflammatory changes, frequently in the form of inflammation of the cellular tissue. In *anteposition* the uterus is situated close to the symphysis, generally, above it and the condition is produced by growths or by accumulations in the pelvis which push up the uterus. The organ, once fixed in the abnormal position, remains. In *retroposition* the uterus is situated at a lower level, and close to the hollow of the sacrum. It results from inflammatory changes which contract and fix the organ; thus, a hematocele in its earlier stages may push the uterus forward into a state of anteposition, but later, as the collection becomes absorbed and organized, contractions occur which draw the organ backward. When the contraction involves the region of the folds of Douglas or the uterosacral ligaments, the fundus of the organ will be pushed forward, and an anteflexion will be established. It is only when the uterus has previously been the seat of metritis and has become so rigid that it resists the tendency to flexion that it retains the retroposed position.

Lateral position, either right or left, is generally due to inflammation in the cellular tissue of the broad ligament. In the acute stage of inflammation the organ may be pushed to the side opposite to that on which the exudation occurs. As the condition becomes chronic, the inflammatory material contracts, and the uterus is drawn to the affected side. These displacements cause no special symptoms. The symptoms, when present, are due to the complications or conditions which have produced the displacement and are not a consequence of the latter.

Diagnosis. The situation of the displaced organ is recognized by bimanual examination. The fixed position and situation are usually sufficient to establish the diagnosis. In lateral displacement the organ is not in a median position, and on manipulation moves more readily toward the affected side. In a woman in whom the abdomen is very fat or the abdominal wall quite rigid, the posterior dislocation is often difficult to differentiate from retroversion. The introduction of the sound would afford information, but the advantage derived from determining the position is insufficient to compensate for the danger from its use. Either the vaginal or rectal bimanual, practised while an assistant drags upon the cervix with a tenaculum or vulsellum, will generally afford a definite determination as to the character of the malposition.

257. **Torsion** is generally associated with either a retroposition or a lateral position, and is due to an irregular contraction of the portion of the broad ligament which has been subject to cellular inflammation. This contraction twists the uterus upon its axis, so that the cornua may be turned anteroposterior instead of being situated laterally. The entire uterus can be thus twisted, so that, upon inspection, the os, instead of being transverse, will present an oblique or nearly anteroposterior line.

Torsion also results from the presence of growths in either broad ligament or of an ovarian tumor to which the tube is adherent. As the tumor enlarges it drags upon the uterus and twists it. This lesion is frequently overlooked, and presents no symptoms of special importance.

258. Anteversion. In anteversion, the uterus is found with its fundus forward and the cervix directed backward or upward and backward. (Fig. 388.) The organ may be fixed in the abnormal position by complications, such as inflammation, which may cause adhesions between the fundus and anterior parietal peritoneum, or more frequently in the cellular tissues about the uterus, the cervix, or in the uterosacral ligaments. An inflammatory process of the uterosacral ligaments with a normal uterus will produce flexion, but when the latter organ is stiffened by long-continued inflammation, anteversion results. The uterus is considerably increased in size; its walls are thickened and often rigid and firm. The normal flexion has disappeared, and the canal is perfectly straight. This position of the uterus is caused by increase of weight, and in severe versions the fundus will lie forward upon the bladder or against the symphysis, while the cervix may be directed upward and backward.

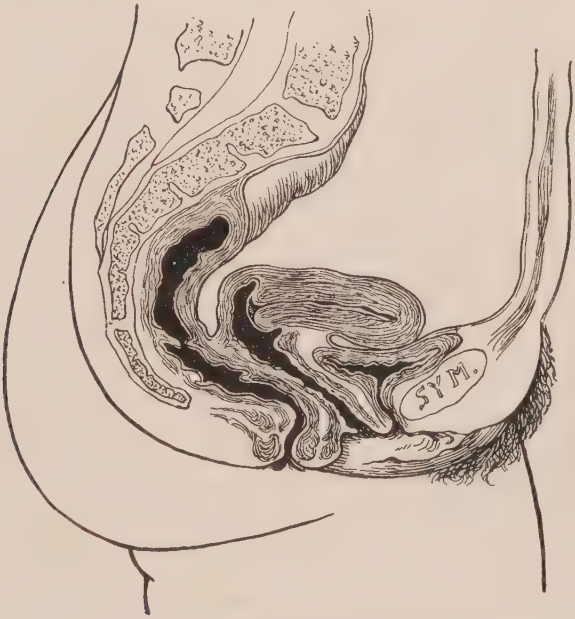


FIG. 388.—Anteversion of the Uterus.

Etiology. Any disorder which increases the weight of the uterus increases tendency to its antedisplacement. When the uterus has been the site of previous inflammation, particularly a metritis, this displacement is necessarily an anteversion. Metritis, subinvolution of the uterus, pelvic cellulitis, occurring in the posterior portion and in the uterosacral ligaments; fibroid growths in the fundus; ovarian growths—all may cause anteversion.

Symptoms. Anteversion presents no characteristic symptoms. The symptoms are those associated with the complication by which it is produced. The patient may complain of a sensation of distress, from pressure upon the bladder, of frequent micturition, and of pain or a dull ache over the region of the symphysis.

Diagnosis. Anteversion is readily determined by bimanual palpation. The cervix is situated high posteriorly, and often reached with some difficulty, while the uterine body can be traced forward and is found to rest upon the bladder. Not infrequently the fundus lies well against the symphysis. The situation of the fundus in the anterior portion of the abdomen, the absence of any angle in the uterus, and its size, weight, and greater or less degree of immobility, definitely differentiate it.

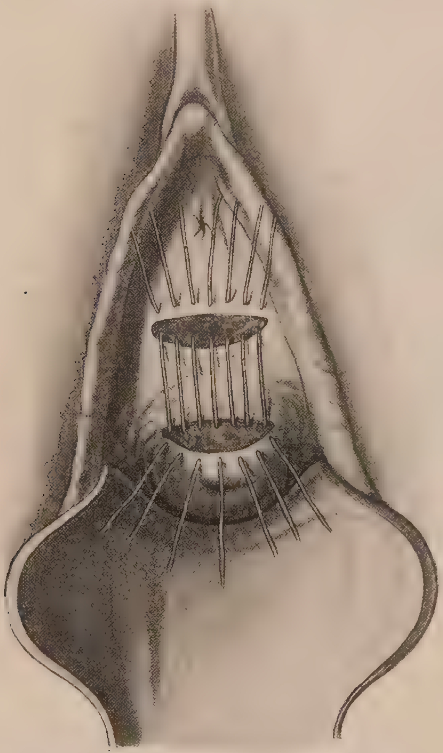


FIG. 389.—Sims' Operation for Anteversion.

Treatment. As we have already seen, anteversion is a symptom or sign rather than an actual disease. It is a condition due to increased uterine weight, and treatment must necessarily be that which is applicable to the existing complication. The most common complication is inflammation, causing hypertrophy or hyperplasia of the uterus, an irritative infiltration and proliferation of the tissue element. The inflammation condition may exist with or without adhesions. The treatment of anteversion, then, in the great majority of cases, is that of existing inflammation—hot vaginal douches, tampons medicated with agents which are expected to exert an influence in decreasing the size of the uterus: Frequently this decrease can be accomplished, to a considerable degree, by thoroughly dilating the uterine cavity with laminaria tents, followed by swabbing the interior of the organ with tincture of iodin, a saturated solution of iodin crystals in 95 per cent. carbolic acid, or a saturated solution of iodoform in ether. Following such an application the decrease in size of the uterus may be promoted still further by iodoform gauze packing of the uterine cavity and a tampon of iodoform gauze in the vagina. This raises the organ to a higher level and promotes its circulation.

Furthermore, the uterus can be dilated with graduated bougies, its cavity cureted, and applications made as suggested. Where the uterus is free from adhesions, it may be supported by a pessary. The pessaries which were devised for the purpose of elevating the fundus have not proved satisfactory. In some cases of heavy uteri the retroversion pessary is particularly serviceable, although it may seem a paradoxical instrument to employ in anteversion. It does, however, afford relief by holding the uterus at a higher level. Pelvic massage employed daily is of special value in promoting drainage, in facilitating metabolism, and in reducing the size of the uterus. Operations upon the cervix, amputation, or the repair of a laceration will excite such a process of metabolism as to decrease the size of the uterus. When the uterosacral ligaments have not become shortened through inflammatory processes causing an irremediable displacement, the operation devised by Sims may be practised. This consists in making a transverse denudation upon the anterior lip, another upon the anterior vaginal wall at a suitable distance from it, and uniting these two surfaces by sutures (see Fig. 389). As a result of this operation the cervix is drawn toward the vulvar outlet, the fundus is tilted upward, and a more correct position is secured. When the uterus is fixed by more recent adhesions, in addition to the treatment already suggested, pelvic massage will prove beneficial. Two fingers in the vagina are hooked behind the cervix and press the fundus of the organ upward; while the external hand is rotated over it, the fingers pressing down along the uterine sides and in front, push the fundus backward. While the uterus is pushed backward with the fingers of the external hand and drawn forward with the fingers in the vagina, bands of adhesion are put upon the stretch and are manipulated to such an extent that their absorption is promoted. The manipulation of the uterus promotes absorption of inflammatory exudate within its walls, and thus assists in decreasing its size, so that by the time the adhesions are stretched and loosened, the uterus is so reduced that the patient is much relieved. In some cases, where a boring pain is experienced over the symphysis, the wearing of a cincture or belt (Fig. 390) will support the abdominal viscera and relieve the intra-abdominal pressure to such a degree that the ache or discomfort will disappear.

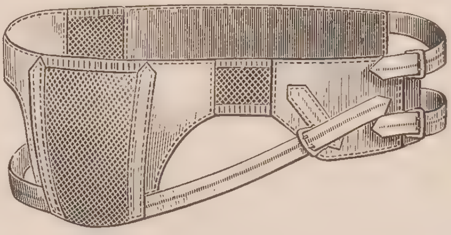


Fig. 390.—Abdominal Belt.

259. Retroversion. In retroversion the uterus is turned with the fundus backward. (Fig. 391.) The cervix is directed forward against the posterior wall of the bladder. This displacement varies in degree according to the relations of the cervix and uterus to the axis of the vagina. The maximum degree is a backward displacement in which the fundus lies low in the hollow of the sacrum, with the cervix directed upward. Retroversion is recognized as an early stage of prolapsus. In this displacement the intra-abdominal pressure is directed upon the fundus or upon the anterior wall of the uterus, which favors downward displacement, so that we usually find retroversion associated with a certain amount of descent.

Etiology. The most frequent cause of retroversion is a lesion of pregnancy. Retroversion occurs in the unmarried or sterile woman, but much less frequently. It is produced by decreased support of the ligaments (particularly the uterosacral), which permits the uterus to sag downward and to be rotated backward; the latter action is occasioned by a distended bladder. Finally the ligaments lose their muscular tone and the organ does not regain its normal position. Retroversion can be produced by traumatism, as when the person falls from a height and strikes upon the feet or, particularly, upon the buttocks, and by the presence of growths in the uterus or in the ovaries.

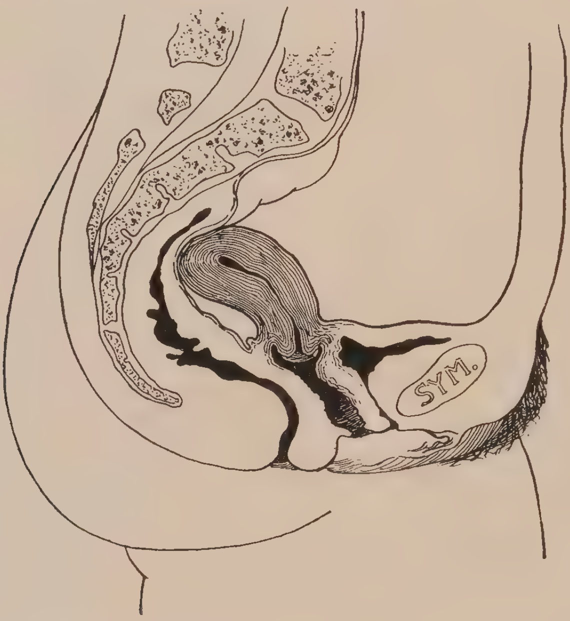


FIG. 391.—Retroversion.

Symptoms. Retroversion causes few symptoms. The discomfort in the majority of cases arises from complications. Patients may have marked retroversion without experiencing any inconvenience or being aware of the condition until it is brought to their knowledge. Inflammatory complications produce a sensation of weight or dragging, as if everything were about to protrude when the patient stands or walks. The menstrual flow is increased, producing menorrhagia; occasionally there is an irregular, bloody discharge, or the intermenstrual intervals are shortened, or, as a result of the coëxisting catarrh, the patient will have a profuse leukorrhea. The projection backward of the fundus and pressure of the cervix against the bladder cause a more or less frequent desire to urinate. Not infrequently there is an extension of the inflammation to the vesical mucous membrane, which produces cystitis. Pressure of the uterus upon the rectum increases the tendency to constipation, interferes with the rectal circulation, and develops hemorrhoids and fissure of the anus. An injury of the anus or rectum under these circumstances is slow to recover, which makes it important, in cases of rectal disease, to ascertain the condition of the uterus before resorting to any operative interference.

Diagnosis. Digital examination discloses the cervix uteri in the axis of the vagina, or looking forward and sometimes upward. Through the posterior vaginal fornix the examining finger recognizes a mass which is continuous on a straight line with the cervix. The bimanual examination discloses the absence of the fundus from the anterior fornix. The rectal bimanual affords an opportunity to explore the fundus and even the anterior surface of the uterus. (Sec. 262.)

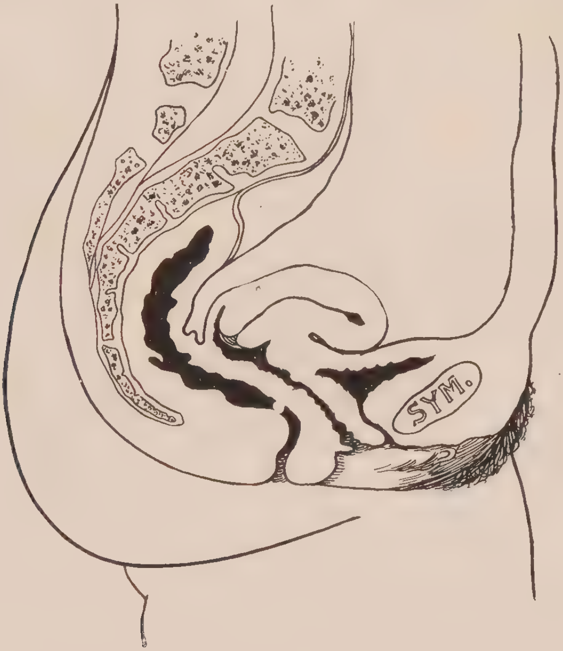


FIG. 392.—Slight Degree of Anteflexion.

260. Lateral version is a form of displacement in which the fundus is situated to one side of the pelvis, while the cervix is directed toward the other. This condition is produced by cellulitis in the broad ligament and by intraligamentary growths, either fibroid or ovarian; in marked cases of inflammation contraction can occur in the base of one broad ligament and in its upper part on the opposite side. This produces a fixation of the uterus directly transverse to the pelvis, not unusually with a certain amount of torsion. The lateral version causes no special symptoms, and is readily recognized by a bimanual palpation.

261. Anteflexion. In anteflexion the uterus is bent upon its axis, with the fundus forward, while the cervix lies more or less in the axis of the vagina. The flexion may be but little more than normal (Fig. 392); indeed, any flexion which is fixed is an abnormal one, even though it may not be greater than the ordinary bending of the uterus. From a slight flexion we may have a very acute one (Fig. 393), in which the fundus and cervix seem to lie upon each other at an acute angle. The anterior wall of the uterus, at the point of flexion, undergoes a change in which there is a substitution of fibrous tissue for the muscle-wall. The posterior surface becomes exceedingly thinned where it bends over the anterior. (Fig. 396.) The anteflexion may be mobile or immobile. The former results from a heavy fundus when the cervix is in a more or less fixed position. Raising the fundus, we can tilt it backward, and leave the uterus in a position of retroflexion, so that at times the organ is anteflexed; at others, retroflexed. Not infrequently a diagnosis of anteflexion will be made when a subsequent examination by another person shows the uterus to be retroflexed. If the fact that the organ is mobile is not remembered, an error in diagnosis will be attributed to the first investigator. In the immobile uterus the flexion is fixed. Anteflexion, again, may be regarded as physiologic, pathologic, or indifferent. A physiologic anteflexion is one which corresponds to the

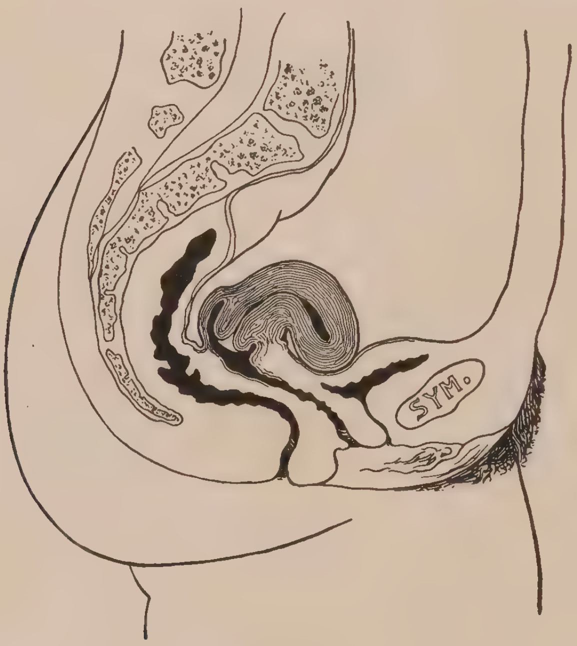


FIG. 393.—Acute Anteflexion.

normal condition of the uterus; a pathologic, one in which the flexion is more or less fixed or is greater than normal; while in an indifferent anteflexion the bending causes no symptoms.

Etiology. Anteflexion is probably next to the most frequent form of uterine displacement, and it occurs less frequently in the married than do the retrodisplacements. It occurs with greater frequency in the unmarried or nulliparous woman, and is a result of congenital conditions, or, rather, those which are associated with the earlier development of the uterus. Anteflexion may be ascribed, first, to the long cervix of the puerile organ, the situation of which, in the vagina, necessitates the fundus bending forward over it. Second, inflammation in the utero-sacral ligament or in the cellular tissue posterior to the uterus, which draws the cervix upward (Fig. 397), promotes, in a flexible body, its falling forward, and the angle between the body and the cervix is increased. Third, the displacement arises fron localized inflammation at the site of the placenta, when situated upon the posterior uterine wall. Involution is more rapid in the anterior, and the shorter wall becomes the string of the bow which bends the uterus forward. Fourth, anteflexion is produced by growths in the fundus of the uterus.

The symptoms most frequently attributed to anteflexion are sterility and dysmenorrhea; but when uncomplicated by inflammation, neither of these symptoms is present necessarily. The patient with marked anteflexion generally suffers from chronic vesical distress. Pain occurs when the bladder is moderately distended, micturition is frequent, and generally there is a sensation of distress and annoyance which follows the evacuation. These symptoms, however, are frequently produced by inflammation in the bladder, so the urine should be carefully examined. Dysmenorrhea has been attributed to an obstruction of the canal by an accumulation of material within the uterine cavity, which the organ has to go into labor to expel. As flexion does not cause dysmenorrhea when the lesion is uncomplicated by inflammation, it is evident that the latter is the cause of the symptom, and that the hyperemia prior to and coincident with menstruation produces pain during the distention of the inflamed surfaces rather than an obstruction of the canal. Even in congenital conditions the dysmenorrhea does not occur with the first menstruation, but later, when there is distinct evidence of the development of inflammatory trouble.

Diagnosis. Anteflexion is recognized by digital and bimanual palpation. The cervix is situated in the axis of the vagina, and, by carrying the finger in front of it, a body is felt in the anterior fornix of the vagina, between which and the cervix a distinct angle is recognized. During bimanual palpation this angle can to some degree be straightened, and the relation of the flexion to the cervix and body is more distinctly recognized. The flexion is particularly determined by passing the index-finger into the lateral fornix, first upon one side and then upon the other. By pressing from above we are able to recognize the lateral borders of the uterus and the absence of any growth. We can be in doubt as to whether the mass found in front is the fundus uteri or a fibroid growth attached to its anterior wall. Each condition may afford an equal-sized angle. The method we have already described, of passing the finger along the lateral aspect of the uterus, will enable us to differentiate them. By changing the position of the organ and pressing it well forward with the hand over the abdomen, we can outline the posterior surface of the fundus, and determine that its size and relations correspond to those of the cervix to the fundus, rather than to a growth. When the uterus is fixed, bimanual palpation is difficult. The position of the organ can be determined by the introduction of a uterine sound into the canal. The use of the sound, however, under these or any other circumstances, is fraught with so much danger that it is preferable to give an anesthetic if necessary for the further practice of the bimanual, rather than to make an intra-uterine exploration.

Rectal palpation with the digital finger, while the thumb of the same hand enters the vagina against the cervix, with the other hand over the abdomen, enables us to bring the uterus definitely under observation.

Treatment. Anteflexion requires treatment only when it is associated with symptoms, and these are usually the result of complications. The symptoms may be caused by complications incident to changes in the uterine structure itself, as inflammation either in its wall or in the surrounding structures. Inflammation may be incident to the various constitutional conditions, as a rheumatic or gouty diathesis, or the effect of neurasthenia, but in such cases the treatment may be constitutional or a combination of both constitutional and local measures. The most frequent symptoms associated with anteflexion are dysmenorrhea or painful menstruation, and sterility. However, that they are not necessarily the result of anteflexion alone is evident, from the many cases in which the patients with marked anteflexion have both menstruated painlessly and given birth to children. Patients suffering from dysmenorrhea associated with anteflexion should be encouraged to live an outdoor life. Hygienic measures are particularly important. The clothing should be suitable, and the extremities be warmly clad. Very frequently women who suffer from dysmenorrhea while in the North will be absolutely free from this symptom when residing in the South or in the Bermuda Islands. Measures should be instituted to improve general nutrition, obviate sluggish circulation, and to regulate the bowels. Such patients are often benefitted by bicycle-riding, playing golf, or anything which leads to an outdoor life. Pelvic or uterine congestion should be decreased by the administration of iodids and bromids, the employment, particularly, a few days to a week before the menstrual period, of gelsemium or pulsatilla, taking five drops of the fluid extract of gelsemium or ten drops of tincture of pulsatilla, three or four times in the twenty-four hours, until the patient exhibits signs of its physiologic action. Thyroid extract is of value in these cases, when the drug is given in doses of three to five grains two or three times in the twenty-four hours. Douches, tampons, painting the vault of the vagina with tincture of iodin, gauze packing, and pelvic massage are all of service. The pessary, particularly the Graily-Hewitt (Fig. 125) or the Thomas anteflexion pessary (Fig. 126), which tilts up the fundus of the uterus, have had their advocates. Their efficacy, however, is somewhat doubtful. Pelvic massage is of special value in these cases, as the manipulation of the uterus serves to straighten the organ and promote a healthy condition of its circulation.

When the condition of the patient is not improved by douches, tampons, or constitutional measures, the uterus may be dilated by the introduction of a laminaria tent. This procedure should be done with the most thorough aseptic precautions, with the vagina thoroughly cleansed, the cervical canal rendered as aseptic as possible. The tent itself should be sterilized, preferably by dry heat, although it may be placed for several minutes in a solution of iodoform and ether, in equal parts of alcohol and carbolic acid, or, better, in iodin tincture, prior to its introduction. The cervix should be seized with a double tenaculum, sponged with a solution of formalin, and by traction straightened so that the tent can be the more readily introduced. As large a tent as the caliber of the cervical canal will allow should be employed. The tent is removed in twelve to fourteen hours, after which the uterine cavity is irrigated, if necessary cureted, swabbed with a saturated solution of iodin in carbolic acid or of iodoform in ether. The canal may or may not be packed with iodoform gauze. The dilatation with tents may be repeated at intervals until the tendency to displacement appears to be overcome and the uterine complication has subsided. Inflammation in the cellular tissue about the uterus, or in the tubes and ovaries, as evidenced by their enlargement and fixation in the pelvis, should be considered as a contra-indication to the use of tents. Dilatation can be accomplished by graduated bougies and their employment followed by curetment. Twenty-five years ago the employment of the stem-pessary was a favorite method of overcoming an anteflexion. The stem was one-eighth of an inch shorter than the uterine cavity; the patient was required to wear it for a considerable length of time. (Fig. 127.) The objection to its use is that it is a source of irritation, affords constant danger of infection to the uterine mucosa, and may lead to the development of more serious trouble. W. Gill Wylie advocated the use of a grooved stem of hard rubber or glass to serve as a drainage-tube. He and others still practise this method of overcoming the dysmenorrhea incident to acute anteflexion and claim marked improvement in many cases. The favorite treatment of Sims was a bilateral incision occasionally one through the posterior lip. Unless precautions are taken to prevent it, the parts are reunited. Even when precautions are employed, cicatricial tissue forms, which subsequently causes distress, sometimes greater even than

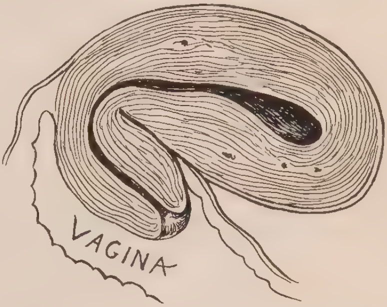


FIG. 394.—Section Showing Thinning of Cervical Walls at the Angle of Flexion.

the preëxisting condition. The posterior lip can be split up to the angle of flexion and its cervical and vaginal lining membranes united by sutures, to prevent reunion. Occasionally, after such an operation, the cervix spreads out, owing to the intra-abdominal pressure, and the more delicate cervical mucous membrane is thus exposed to pressure and irritation, resulting in endometritis and formation of cysts of Naboth, which will require continuous treatment. Splitting the anterior lip has been advocated. This is performed by dissecting the bladder from the anterior wall of the cervix to the level of or above the point of flexion. A grooved director is then introduced into the uterus and the cervix is incised. As the incision approaches the os it is carried around to the side of the cervix. The cervical mucous membrane is united to that of the vaginal wall. This enlarges the opening from the front and prevents obstruction, but is subject to the same objection made to the posterior operation, in that it exposes delicate surfaces to irritation and subsequent inflammation. E. C. Dudley has devised an ingenious operation, in which he splits the posterior lip to or beyond the vaginal attachment; the surfaces are held apart by tenacula and the incision is deepened upon the cervical side with a knife. A wedge-shaped piece is removed from each side, and the sutures are so introduced as to unite the edge or apex of the incision on each side with the base. By this method eversion of the cervical mucous membrane is prevented. (See Fig. 396.) The anterior lip of the cervix is then amputated, and

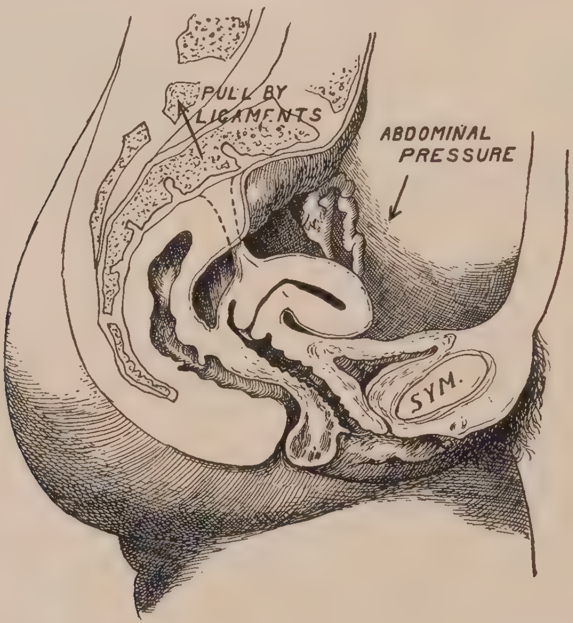


FIG. 395.—Anteflexion Associated with Contraction of Uterosacral Ligaments.

the wound closed with transverse sutures, which push back the cervical orifice and straighten the canal. (See Fig. 397.) Nourse, recognizing that the flexion corresponded to the shorter wall, made a bilateral incision to the level of or a little above the angle of flexion. Traction is then made upon the posterior lip, whch results in straightening the canal. The new surfaces are apposed and secured with sutures, leaving the posterior lip longer. When the latter is half an inch or more in length, it is amputated by the flap method, thus making it the same length as the anterior lip. The raw surfaces are united by suture. (Figs. 398 and 399.) When the elongation is short, it is left to contract. C. A. L. Reed advocated opening the abdomen and removing a wedge-shaped piece from the posterior wall of the uterus opposite the angle of flexion. This surface is closed by vertical sutures and restores the organ to normal position. Burrage advises, in proper cases, incision of the utero-sacral ligaments and the performance of a ventrosuspension, thus raising the fundus of the organ upward.

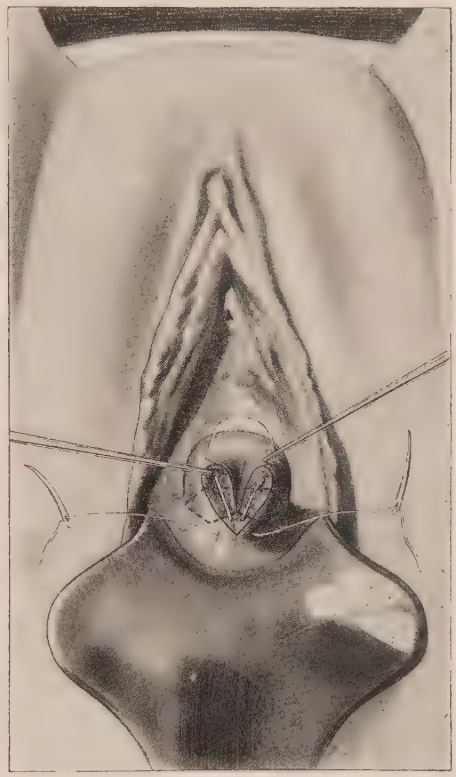


FIG. 396.—Dudley's Operation for Anteflexion, by Incising and Suturing the Posterior Lip.

262. **In retroflexion** the fundus is bent backward upon the uterine

axis, and, according to its degree, lies toward the rectum (Fig. 400) or is forced well down into Douglas' pouch. (Fig. 401.) The cervix is in the axis of the vagina. The retroflexion may be mobile or immobile, may be pathologic or indifferent, but never can be said to be physiologic. This form of displacement is very frequently a sequel of version. The uterus becomes retroverted and the abdominal pressure then drives the fundus downward, bending it upon its axis, forcing it into Douglas' pouch. (Fig. 402.)

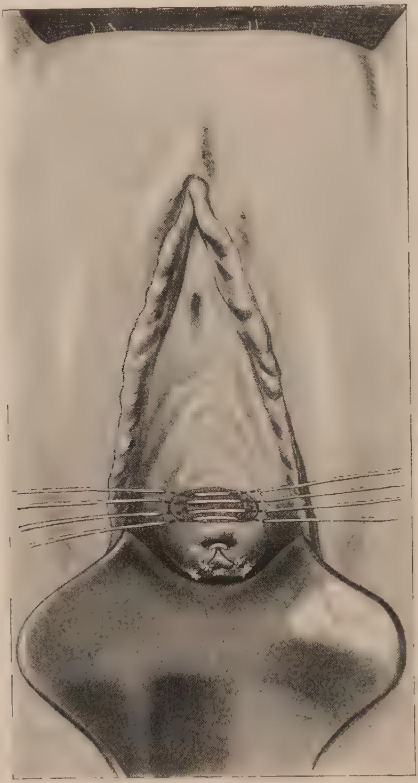


FIG. 397.—Completion of Dudley's Operation, by Transverse Denudation and Suturing of the Anterior Lip.

Etiology. Retroflexion is produced by metritis; subinvolution; inflammation of the placental site, in the anterior wall of the organ; fibroid growths in the fundus or anterior uterine wall (Fig. 403), parametric inflammation, or cellulitis of the anterior segment of the pelvic floor, which draws the cervix forward; localized peritonitis; or contraction following hematocele (Fig. 404), by which the fundus of the organ is drawn backward.

Symptoms. Retroflexion, like the other forms of displacement, presents no special symptoms, when uncomplicated. It produces a sensation of weight and pressure, not infrequently pain in the region of the anus, an uncomfortable sensation down the posterior surface of the lower extremities, points of anesthesia over the thighs, congestion, partial obstruction of the rectum, obstinate constipation, and not infrequently a sensation that the intestine is so obstructed that the bowel cannot be evacuated. Not unusually development of hemorrhoids, anal fissures, and more or less prolapse of the rectal mucous membrane follow. Menstruation is irregular and profuse, or the menstrual intervals are shortened, and leukorrhea is quite profuse.

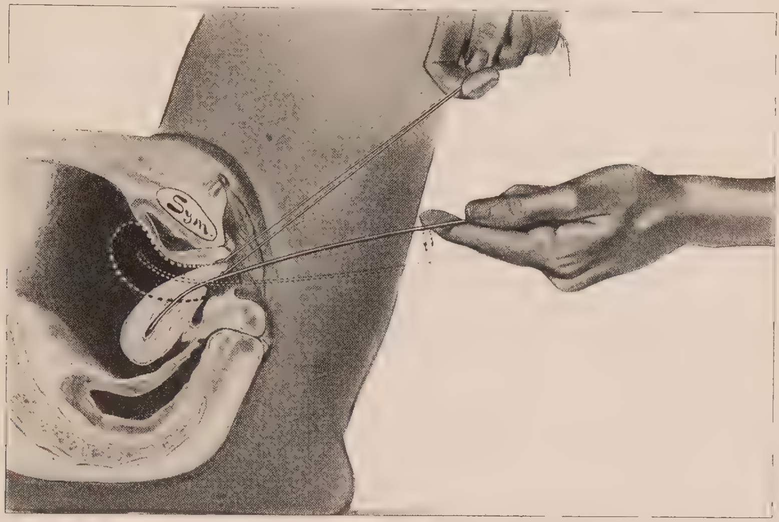


FIG. 398.—Nourse's Operation by Splitting the Cervix and Resuturing the Incisions.

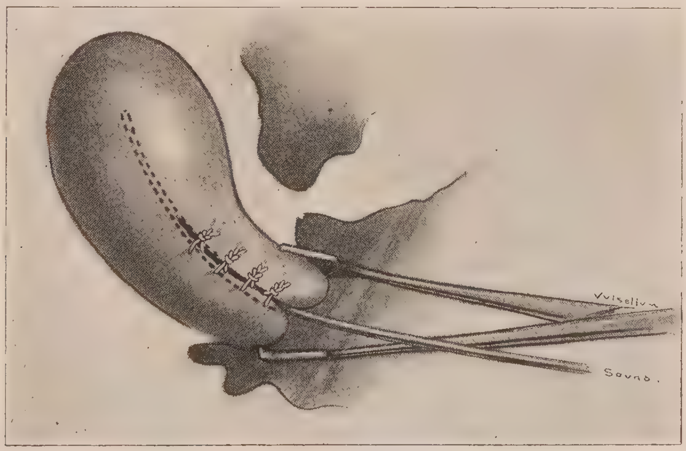


FIG. 399.—Operation Completed.

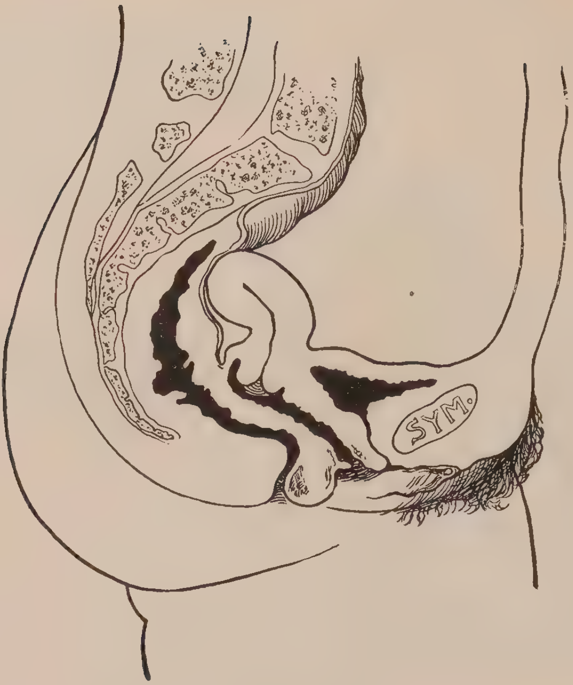


FIG. 400.—Retroflexion of Slight Degree.

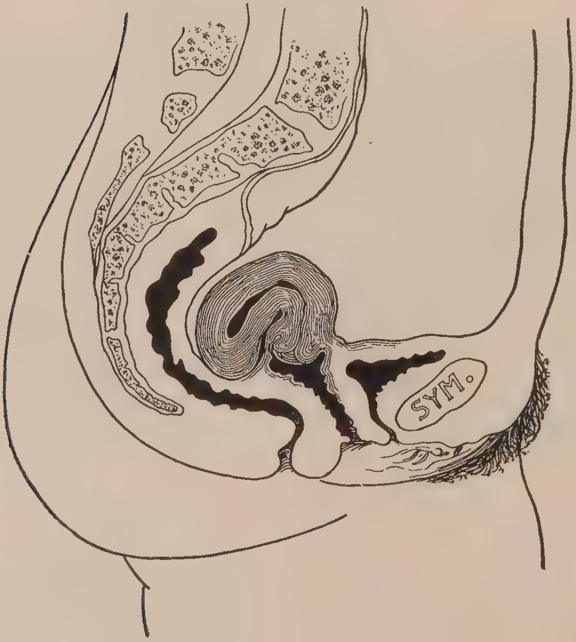


FIG. 401.—Retroflexion of Extreme Degree.

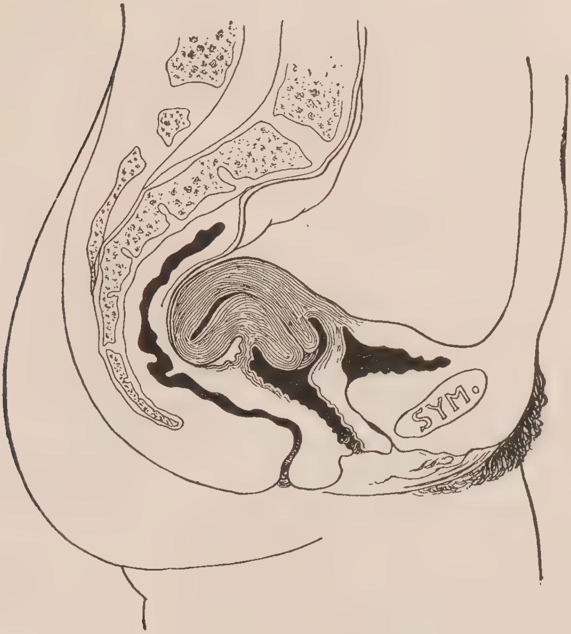


FIG. 402.—Retroflexion Following Version.

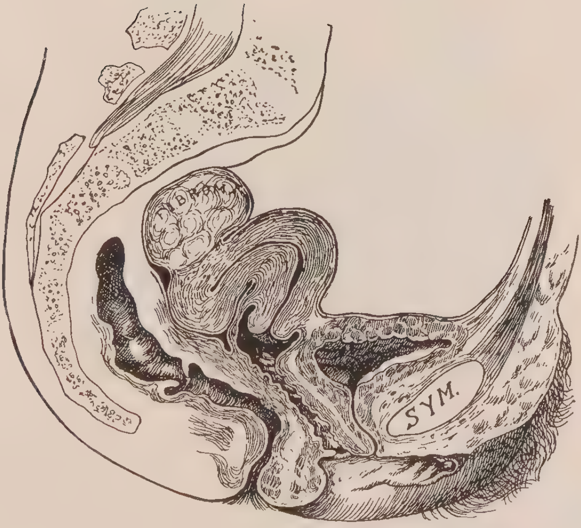


FIG. 403.—Retroflexion Produced by Fibroma of Anterior Uterine Wall.

Diagnosis. Digital examination discloses the cervix situated at a lower level in the pelvis, occupying the axis of the vagina or directed a little anteriorly; the finger in the posterior fornix recognizes a body slightly above, or even below, the cervix, which is rounded, may be movable or fixed, and somewhat larger than the normal fundus. Between it and the cervix is a distinct angle, though the structures can be traced from one to the other. The finger in the anterior vaginal fornix and the other hand over the abdomen discloses the absence of the fundus uteri from its normal position. The flexion is apparently increased by pressure upon the cervix, and the fundus is driven more deeply into the cul-de-sac. By pressing the finger upward on either side of the uterus and cervix the lateral margins can be determined. Digital examination through the rectum enables us to pass directly over the fundus and to feel to some

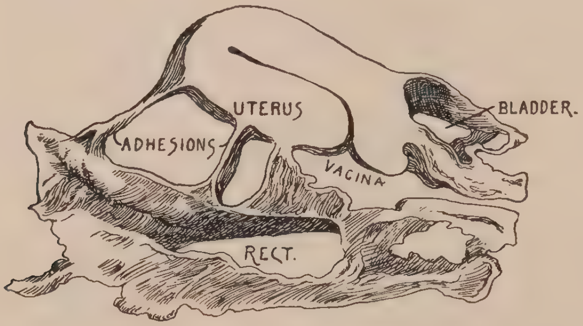


FIG. 404.—Retroflexion the Sequel of Inflammatory Adhesions.

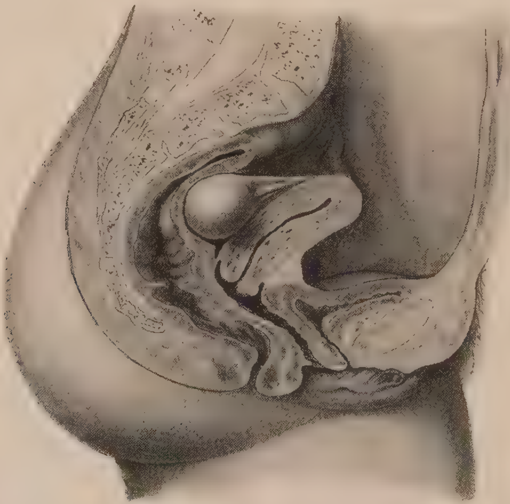


FIG. 405.—Retroflexion Simulated by Posterior Uterine Myoma.

degree its anterior surface, which now becomes posterior. Retroflexion of the uterus can be confounded with fibroid growths (Fig. 405) situated in the posterior uterine wall, adherent ovarian growths (Fig. 406), or pelvic inflammatory exudation. (Fig. 407.) The introduction of the sound into the uterine canal, and its passage backward into the mass, would be definite evidence that a retroflexion exists; but, as in other

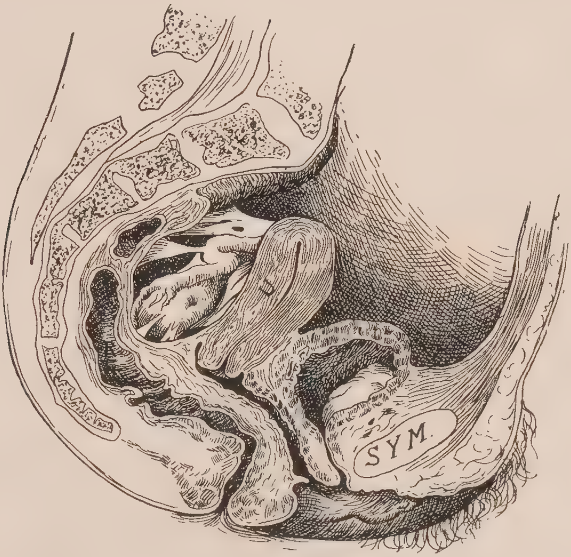


FIG. 406.—Retroflexion Simulated by Small Ovarian Cyst in Posterior Cul-de-sac.

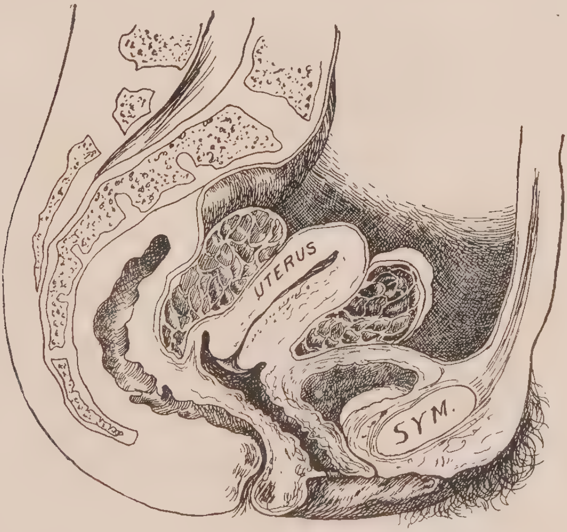


FIG. 407.—Anteflexion and Retroflexion Simulated by Pelvic Exudation.

uterine conditions, this procedure is fraught with so much danger as to condemn it. With a careful bimanual examination, as has been advised, either by the rectum, the vagina, or both, we are generally able to determine the relations of the uterus to the surrounding parts, and to fix the diagnosis absolutely. When the existence of pelvic exudate or immobility of the uterus and a resistant or thick abdomen prevent its accomplishment, the patient should be given an anesthetic.

263. Treatment of Retroversion and Retroflexion. As retroflexion is simply a bending of a version, we will, therefore, consider the treatment of these two conditions together. As the majority of other displacements are not characterized by symptoms, unless complications are present, so, in these conditions, symptoms are not manifest without the existence of complications. However, in maintaining a retroposition the circulation of the organ is interfered with. This results in congestion and subsequently in more or less inflammation. Therefore the treatment of the complications is ineffective so long as the displacement remains. The relief of the inflammatory condition is expedited by maintaining the uterus in a correct position. Treatment largely depends upon the duration of the displacement, the changes which the structures have undergone, and the ability to replace and maintain the organ in proper position. No means for retaining the uterus in position are effective until it has been accurately replaced first, when it can be supported with relief of many of the distressing symptoms.

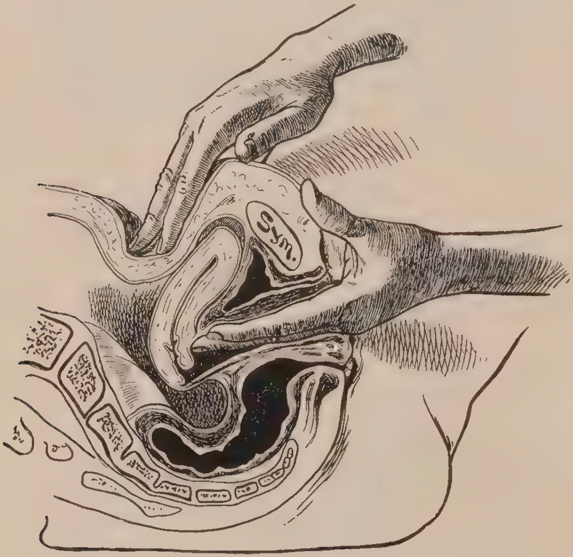


FIG. 408.—The Retroverted Uterus Replaced; Patient in Dorsal Position.

Three methods are generally recognized as proper for replacing the organ. The first is the bimanual. The patient is placed in the dorsal position with her limbs flexed. Two fingers are introduced into the vagina, while the fingers of the other hand are placed over the abdomen (Fig. 408.) The middle or long finger is passed into the posterior fornix of the vagina to press up the fundus, while the index-finger is carried in front of the cervix to push it backward. The pressure against the lower end of the lever carries the opposite end, the fundus, forward, until it can be grasped by the external hand and brought into a position of anteversion. In some cases the fundus of the uterus is caught beneath the promontory of the sacrum and cannot be dislodged readily. If the cervix, however, is grasped with a double tenaculum or vulsellum, and drawn down, while the fundus is pushed up with the finger in the vagina or rectum, the fundus uteri is readily displaced from beneath the promontory and the cervix can then be carried backward.

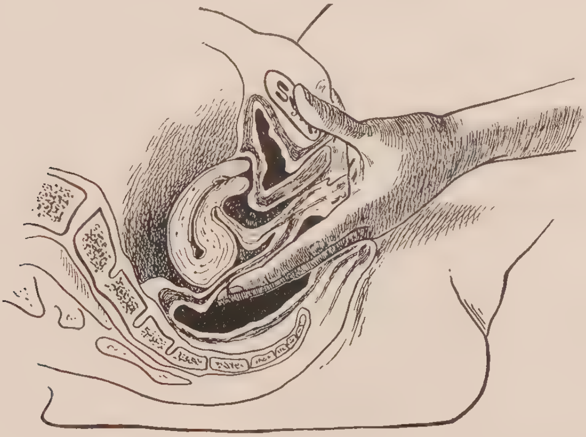


FIG. 409.—Schultze's Method of Replacing an Adherent Retroverted Uterus.

The second procedure consists in placing the patient in the genupectoral position and using the Sims speculum to open the vagina. The atmospheric pressure balloons the vagina and the uterus is carried to the upper part of the canal. This procedure, however, does not of itself correct the position, as the uterus, though elevated, may still be retroflexed or retroverted. The position, when uncomplicated, may be corrected readily by seizing the cervix with a tenaculum or vulsellum, and drawing it toward the vaginal orifice, and then carrying it backward and upward. The fundus is thus dislodged and the position corrected.

A third procedure consists in the employment of the uterine sound. With the patient in the dorsal position, two fingers are introduced into the vagina and the sound, carried between them, enters the os and is introduced to the fundus and then rotated. The external end of the sound is carried through a wide arc so as to do as little injury to the internal mucous membrane as possible, while the handle of the sound is depressed and the finger in the posterior fornix pushes the fundus upward. This combined movement carries the fundus forward until it can be controlled with the external hand. In spite of the most careful precautions the uterine mucosa will be injured by this method of procedure. It is exceedingly difficult to avoid the danger of the introduction of infectious material into the uterus, which necessarily favors the development of further complications. For such reasons, the sound should not be employed, especially as every purpose attained by its use can be readily accomplished by methods already described. Various jointed sounds have been devised for the purpose of replacement of retrodisplaced uteri, but these instruments are open to the same objections offered to the use of the ordinary sound.

In adherent uteri none of these methods of procedure will accomplish the restoration of the displaced organ. When the adhesions exist between the posterior uterine surface and the anterior rectal wall, the intestine may be dragged up with the uterus and apparently permit it to assume its normal position; but as soon as the supporting force is removed, the uterus is drawn back and, if mechanical efforts are employed to retain it in position, the fundus is bent backward and the retroflexion is greatly increased. If adhesions are present and they are not too firm nor of too long duration, pelvic massage affords a valuable method for overcoming their baneful influence and promoting their absorption. The massage should be supplemented by the use of tampons. In some cases the pressure of an air pessary within the vagina stretches the bands of adhesions, promotes their absorption, and supports the uterus. Schultze advocated a procedure which is very effective in overcoming recent adhesions. The patient is placed in the dorsal position, with the muscles well relaxed by an anesthetic. Two fingers are introduced into the rectum, while the thumb in the vagina against the cervix steadies the

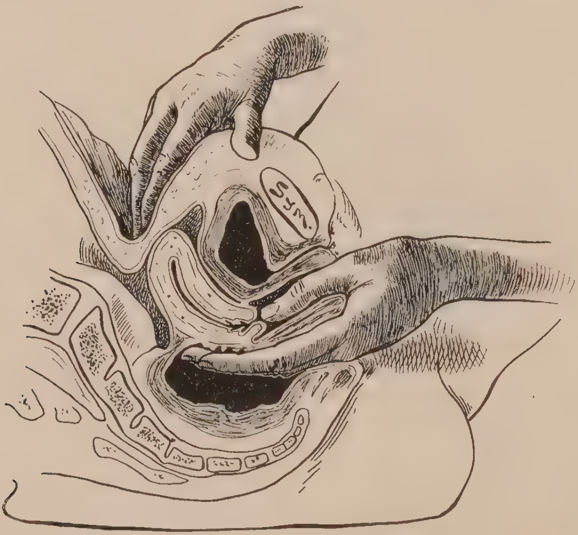


FIG. 410.—Second Step in Replacing Uterus by Schultze's Operation.

uterus until the fingers in the rectum, one on either side of the fundus, can invert and draw down the bowel and separate it from the uterine surface. (Figs. 409 and 410.) As the adhesions are separated and the uterus is set free, the external hand grasps the fundus and draws it forward, breaking the remaining bands of adhesion. Care must be exercised in carrying out this procedure not to employ too much force, otherwise the intestine may be injured. There is more danger, however, of injuring the tubes or ovaries, when these organs are adherent. An adherent tube may be torn and liberate at the seat of inflammatory trouble, poison which, if of a purulent character, may cause a violent attack of pelvic or possibly general peritonitis. With purulent inflammation or pus collections in the tube excluded, the absorption and loosening of the adhesions of the ovary, tube, and uterus can be effected by pelvic massage. If the adhesions are extensive and the vagina tender, especially when its posterior fornix is more or less obliterated by the long duration of the displacement, the uterus can be temporarily supported by the employment of vaginal tampons, medicated or not, as the conditions require. The employment of continual pressure over the abdomen or within the vagina may be effected by shot-bags or the employment of rubber bags containing mercury. Three to five pounds or more of shot may be applied over the abdomen to make pressure over a mass of exudate and thus promote its absorption and the release of an adherent uterus. The absorption of the vaginal exudate may be expedited by the use of mercury, applied in a rubber bag. Such a weight introduced into the vagina,

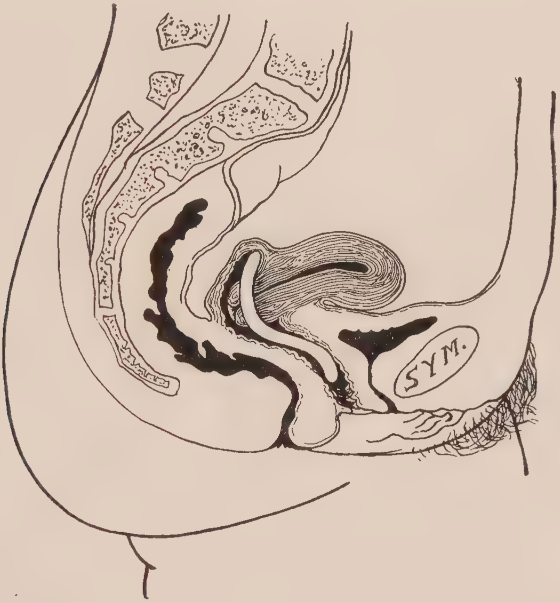


FIG. 411.—Proper Position of the Pessary.

with the position of the patient changed from time to time in order to subject different portions of the exudate to the weight, promotes absorption and the consequent loosening of the uterus and pelvic structures.

When the uterus is free from adhesions and, consequently, can be readily replaced, we can at once resort to the use of a pessary. (Sec. 112.) Some of the more prominent retrodisplacement pessaries are the Hodge (Fig. 120), Thomas, Munde (Fig. 121), and the Schultze (Fig. 130) instruments. The various modifications of the Hodge pessary consist of a posterior bar with converging side bars which are united by a shorter bar anteriorly. Laterally, the pessary has the shape of a letter **S**. The posterior bar is carried behind the cervix into the posterior fornix. In its modification by Thomas and Munde, the posterior bar is thickened, which makes a larger mass in the fornix. The pessary does not support the body of the uterus on its posterior bar, but it so drags upon the posterior vaginal fornix as to pull against the cervix and lift it up, until the other end of the lever—the fundus—is held so far forward that the intra-abdominal pressure is directed upon the posterior uterine surface. This pulley-like action of the pessary is readily seen in Fig. 411, which shows the proper position of the pessary in relation to the uterus and vagina. It has already been emphasized that the pessary does not support the body of the uterus, and that the position of the organ must be corrected before the introduction of the instrument. The result of an attempt to employ the pessary to correct the position of the uterus can be seen in Fig. 412. It is very important that the pessary should not be unduly

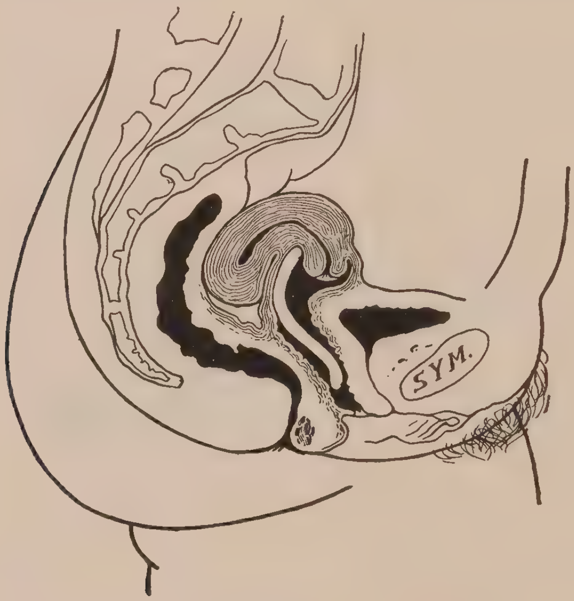


FIG. 412.—Faulty Position of the Pessary.

long. When too much pressure is produced, ulceration of the vagina occurs, rendering the patient unable to retain it. If the instrument is too long, it may project from the vulva and cause irritation about the urethra or neck of the bladder, and much discomfort in sitting. The proper length of the pessary is determined readily by the introduction of two fingers into the vagina to measure the distance between the distended posterior vaginal fornix and the internal margin of the symphysis. The proper width of the pessary is appreciated by determining the extent to which the fingers can be separated without undue lateral pressure in the vagina. The proper size of the instrument to be employed is thus ascertained. While too long a pessary produces the conditions we have already mentioned, one too short allows the fundus of the uterus to fall backward over its posterior bar, increases the retroflexion and adds to the distress of the patient. It is difficult to maintain the pessary in place where the vagina is much relaxed. If the uterosacral ligaments are much elongated, and the posterior fornix distensible, the pessary will fail to maintain the uterus in its normal position. Moreover, it will permit the organ to drop back and rest upon the instrument. (Fig. 412.) Schultze designed the pessary known as the figure-of-8, which is very effective for such cases. This pessary laterally is similar in shape to the Hodge instrument, forming a letter S. The lateral bars of this pessary are twisted to form a figure-of-8, the upper loop of which surrounds the neck of the cervix and carries it upward, while the inferior loop is so broad that it receives support from the vagina and does not incline to prolapse. Should the figure-of-8 prove unsatisfactory, the sledge pessary of Schultze may be efficient. (Fig. 131.) Its posterior end has a bar curved forward, which rests in front against the cervix and holds it back, while at the same time traction is made upon the cervix through the distention of the posterior fornix by the upper part of the instrument. The pessary should be sufficiently broad to impinge against the side walls of the vagina to prevent its slipping down. It distends the vagina in three directions—in length, laterally, and in the anteroposterior direction. When adhesions are present, the pessary is badly borne and is harmful. It is at all times a foreign body and produces a certain amount of irritation in the vagina, which, to many patients, is a source of much discomfort; besides, it is not always efficient in maintaining the uterus. As it must be worn for months or even years to secure sufficient contraction to maintain the organ, many patients prefer to submit to operative interference.

The pessary may be employed in retroversions due to subinvolution of the uterus subsequent to a recent delivery. In such cases the pessary will maintain the uterus at a higher level, promote the process of involution, and thus favor the maintenance of the organ in a replaced position after it has reached its normal size. It may be employed after adhesions have been broken up, by the Schultze method, or when we have been able to accomplish the loosening of the uterus by pelvic massage. Where retrodisplacement has existed for some time, the posterior fornix of the vagina may be so shortened that a pessary cannot be worn. Such a condition will require treatment by douches and tampons until the posterior vaginal fornix is stretched. Pessaries are also of little value in those cases in which the vaginal portion of the cervix has been destroyed by amputation or as a result of repeated labors.

As the pessary is a foreign body, it is therefore important that explicit directions should be given regarding its management before this subject is dismissed. Directions have been given for the determination of a suitably sized instrument, and I would again emphasize the fact that the instrument should be neither too large nor too small. The former will cause pressure upon the surrounding parts, producing irritation, ulceration, loss of structure, and open avenues for the entrance of infection. A smaller instrument is easily dislodged from its position, does not serve any useful purpose, and may only serve to aggravate the condition. The patient should be directed to remove the instrument or have it removed if it causes increased discomfort, and return to the physician within a week at least after its introduction. He can then determine definitely whether the instrument is serving its proper purpose or causing any irritation. In neurotic patients too much attention must not be given to the instrument, otherwise the patient will manufacture a long train of distressing symptoms and attribute them to its presence. The instrument is likely to increase the vaginal discharge, and for this reason it is important that it should be kept clean. It is undesirable, however, to employ mineral astringents in the douche for this purpose, as they are likely to roughen the pessary, and cause it to irritate the vagina. A properly fitting instru-

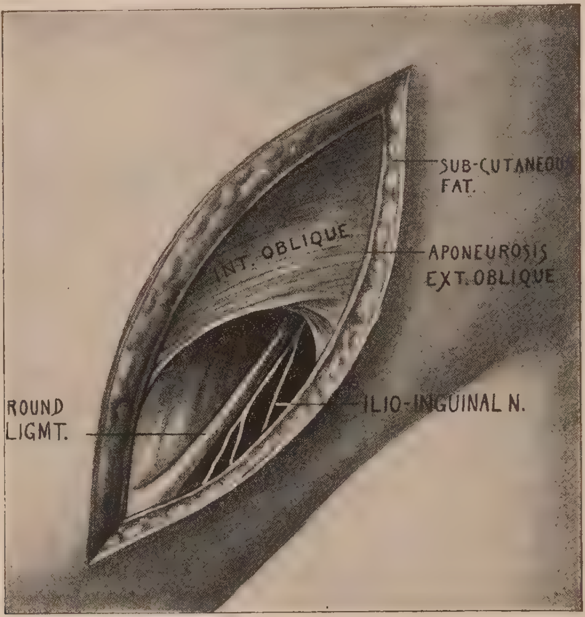


FIG. 413.—Alexander Operation; Round Ligament Exposed.

ment can be worn without the patient's being aware of its presence, but even though it causes no annoyance, she should be advised to have it removed at stated intervals—not exceeding three months—for cleanliness and to make sure that it is doing no harm. These rules apply to the hard-rubber instrument. Where the instrument is of the soft-rubber variety, it should be removed more frequently, as the discharges to some degree enter into the rubber, decomposition takes place, and a foul odor arises which is very annoying to the patient and to those with whom she is associated; moreover, it may cause systemic infection.

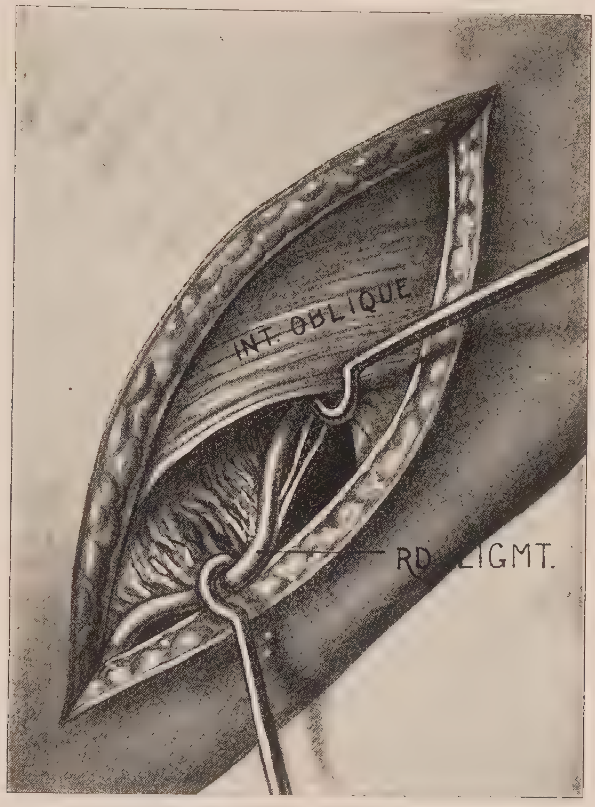


FIG. 414.—Round Ligament Being Drawn Out.

Operative procedures for the correction of retrodisplacements of the uterus consist of extraperitoneal and intraperitoneal shortening of the round ligaments, by abdominal or vaginal incision, and the construction of artificial ligaments, as in ventrofixation or ventrosuspension. Besides these, there are also numerous vaginal operative methods for correcting retroplaced uteri.

Extraperitoneal Shortening of the Round Ligaments. Shortening of the round ligaments is an operation which was performed by Alexander in

December, 1881, and two months later by Adams, although the latter contributed the first publication. The operation had, however, been advocated by a Frenchman named Alquie, as early as 1840.

The operation requires two incisions, and each consists of four stages:

1. An incision six centimeters long, a little inside the pubic spine and above and parallel to Poupart's ligament, is made through all the tissues to the aponeurosis of the external oblique. (Fig. 413.)

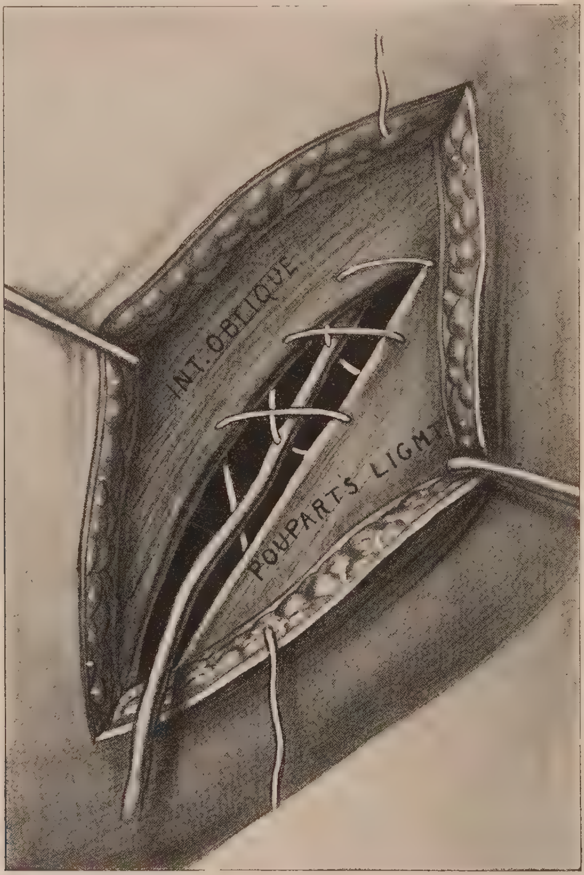


FIG. 415.—Round Ligament Sutured.

2. Exploration for the round ligament. This is disclosed by a small ball of fatty tissue which covers its end between the pillars of the external inguinal ring. Pressure upon the side causes the mass to protrude. A hook passed beneath this mass enables the operator to raise up the ligament. (Fig. 414.) It is then detached by a director, from the posterior adherent fibers which maintain its relation to the inferior part of the canal, after which it is seized with a pair of forceps and drawn out.

3. Upon the completion of the first and second stages, on both sides,

we proceed to the third, which consists in shortening and fixation of the ligaments. The ligaments are drawn upon until the fundus is brought under the pubes. This movement can be facilitated and rupture of the fibrous filaments avoided by previously placing the uterus in anteflexion, either by the sound or preferably by the aid of the fingers of an assistant. The ligaments are drawn out from four to ten centimeters, according to the resistance. When they become tense, they are maintained by an assistant, while a needle charged with silk, silkworm-gut, or catgut is made to traverse the external pillar, the ligament, and next the internal pillar. (Fig. 415.) Three sutures are thus introduced, one centimeter apart. (Figs. 416 and 417.)

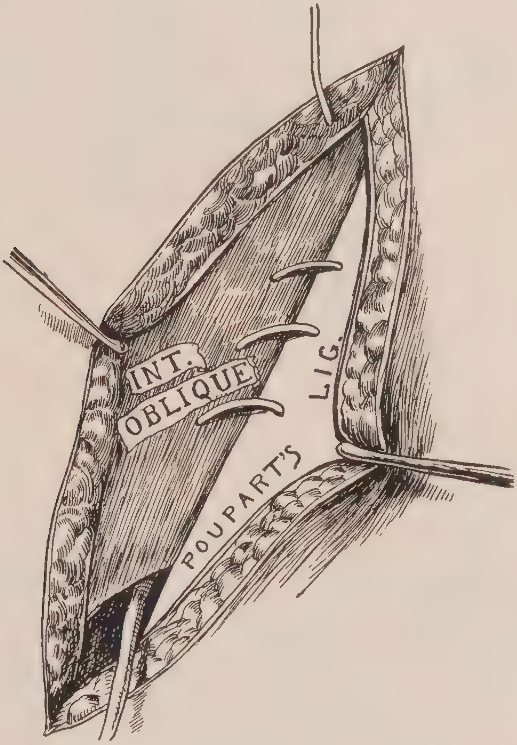


Fig. 416.—Continuous Catgut Suture Uniting Internal Oblique Muscle to Poupart's Ligament.

4. The wound is closed with silk or silkworm-gut sutures, dressed with gauze, and the parts so secured by bandaging as to prevent the wound from becoming exposed by the movements of the patient. The wearing of a Hodge pessary for two months following the operation is advisable, though some prefer the tampon. Various modifications of this operation have been devised. Edebohls splits the entire length of the inguinal canal, draws the ligaments out at the internal ring, and closes the wound as in the Bassini operation. Newman makes an incision directly over the internal

ring, draws the ligament straight out, and secures it in the wound. Franklin Martin and Duret, of Lille, do not use sutures, but pass a pair of dressing forceps beneath the skin and subcutaneous tissue from one wound to the other, draw the ligament through, tie the two ligaments together in a knot, and close the tissues over the union. Cassati joins the lower ends of the lateral wounds with a curved incision, in which the crossed ends of the ligaments are united by continuous suture. Doleris employs the same method, uniting the two ligatures with catgut sutures, after pulling them through, as in the method suggested by Martin. Goldspohn suggested and practiced stretching the internal ring and opening through the peritoneum, so that the finger can be passed into the pelvis and break up adhesions ahout the uterus, ovaries and tubes. He has, however discontinued it as he feels assured it does not afford the same facility as is gained by other procedures.

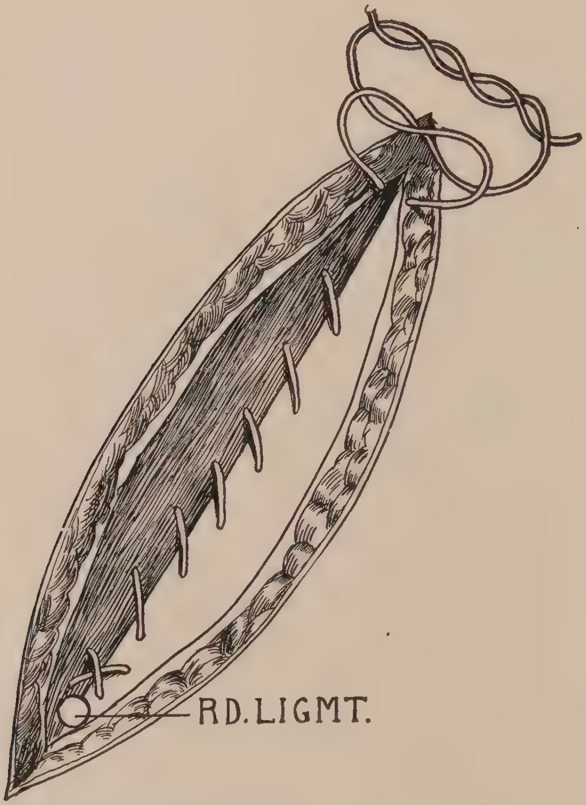


FIG. 417.—Return Layer of Suture Bringing External Oblique Muscle in Apposition.

The advantages claimed for the Alexander operation are: 1. The incisions being superficial or extraperitoneal, the risk of infection is less; as it is local, the danger of peritonitis is decreased. 2. The method of maintaining the uterus forward has less injurious influence upon a future pregnancy. 3. It imitates the natural support, in that the natural ligaments are employed. 4. No intraperitoneal adhesions can form. The disadvantages are: 1. That two incisions are required. 2. The operation is limited in its application. It is only in those cases in which the uterus is mobile that we can practise this procedure. Consequently it has the further disadvantage in that we are not always able to determine definitely the existence of adhesions between the uterus and the anterior wall of the rectum. Should such adhesions exist, the uterus drawn forward by the round ligaments is subject to forces which tend to render the operation nugatory. 3. The round ligaments are sometimes so attenuated as to be of little use in maintaining the organ. In an operation of mine the

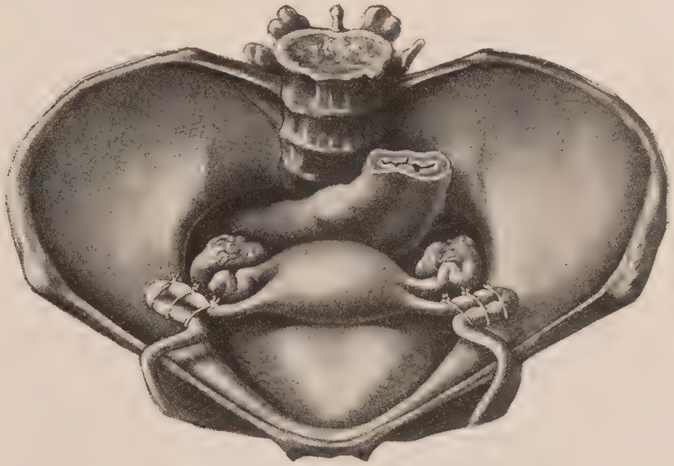


FIG. 418.—Wylie's Operation for Shortening the Round Ligaments within the Abdomen.

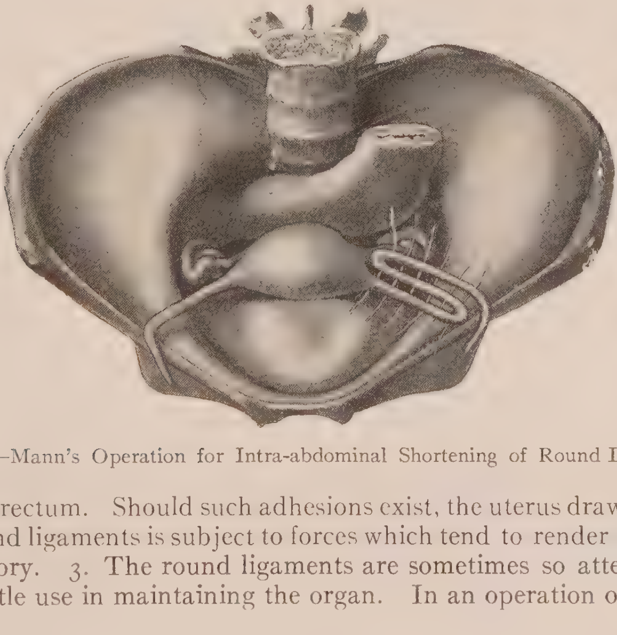


FIG. 419.—Mann's Operation for Intra-abdominal Shortening of Round Ligaments.

ligament on one side was apparently entirely absent. I found no vestige of it in the canal. I therefore opened into the peritoneal cavity and found that the round ligament had disappeared. 4. In cases of infection the infected ligament may slip back and carry infection beneath the peritoneum, where it will be difficult to reach, and, consequently, render the operation not altogether free from danger.

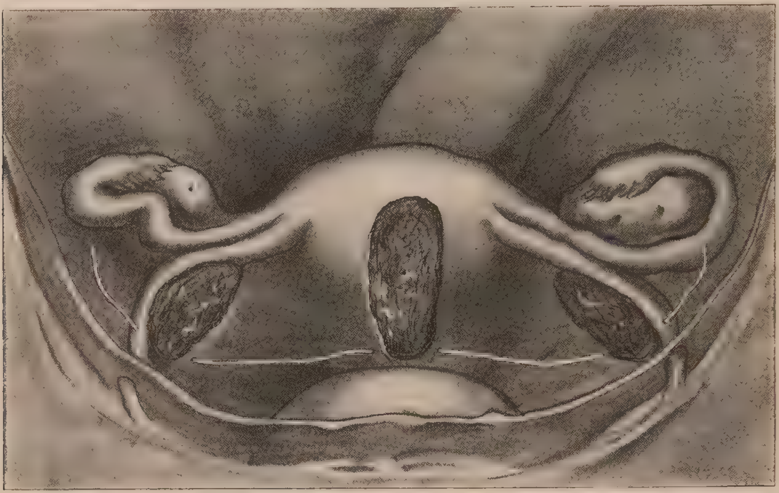


FIG. 420.—Dudley's Operation of Desmopycnosis.

Intraperitoneal Shortening of Round Ligaments. The round ligaments are shortened within the peritoneal cavity by making an incision through the abdomen in the median line. This procedure permits the uterus to be drawn up, and the condition of the appendages to be examined and treated, if necessary. Existing adhesions can be broken up and the round ligaments shortened by folding them. (Fig. 418.) Wylie suggests that two to four inches of the ligament be doubled up on each side and united by sutures, so the shortened ligament draws and holds forward the fundus. Mann grasps the broad ligament about the junction of its middle and outer third and folds the ligament in three parts which are

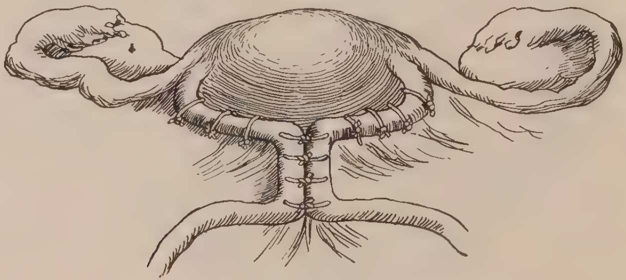


FIG. 421.—Dudley's Operation Completed.

united by sutures. (Fig. 419.) By this method the ligament is well shortened on each side. A. P. Dudley, of New York, performed an operation which he called desmopycnosis. (Fig. 420.) This is accomplished as follows: The abdomen opened, an assistant introduces two fingers into the vagina and pushes the uterus as high as possible in the pelvis, while the operator brings the organ through the abdominal incision. An oval denudation is made upon the anterior uterine wall, making sure that the bladder is not injured; then each round ligament is brought up to the portion of the peritoneal covering on the inner side, denuded to correspond with that on the uterus, and the three denuded surfaces are then united with catgut sutures. The sutures must be so adjusted as to pass sufficiently deep in the uterine tissue to secure against their cutting out before union has occurred. (Fig. 420.) This procedure holds the uterus forward in a position of anteversion. Ries cuts a slit through the anterior surface of the fundus, through which a loop of each round ligament, drawn out of its sheath, is carried and fastened. Bissell excises a portion of the round ligament and unites the cut ends with catgut sutures. Webster picks up a loop of the round ligament, carries it through the broad ligament beneath the Fallopian tube, and secures it to the posterior surface of the uterus. This procedure has been modified by Baldy, who ligates the uterine end of the round ligaments, incises each ligament external to the ligature, and carries the free end, rather than the loop, through the broad ligament and fastens it to the posterior surface of the uterus. All these operative procedures, however, act upon the strongest part of the ligament, leaving the weakest portion, that which occupies the inguinal canal, to be stretched out. Gilliam devised a procedure (Fig. 422) which consists in picking up the ligament, three or four centimeters from its uterine end, and carrying a loop of it through a

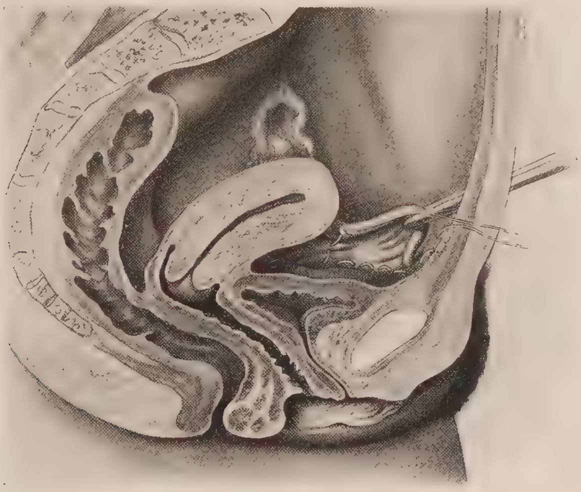


FIG. 422.—Gilliam-Ferguson Operation. Round Ligament Seized through Stab Wound.

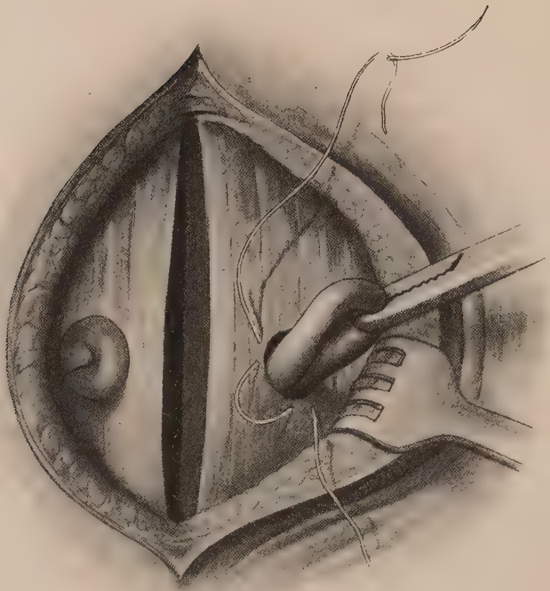


FIG. 423.—Round Ligament Drawn through the Abdominal Wall.

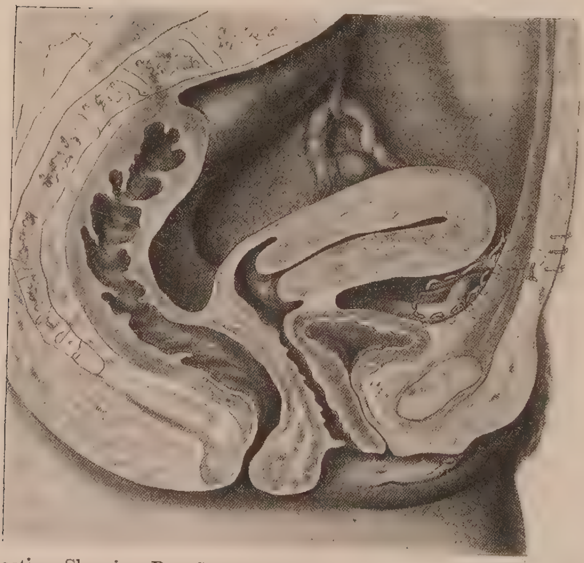


FIG. 424.—Section Showing Position of the Uterus with Completion of the Operation.

stab wound in the lower part of the rectus muscle on either side, and there securing it. (Fig. 423.) This procedure divided the lower part of the abdomen into three apertures, through two of which coils of intestines were capable of being pushed and compressed to a greater or less degree. To obviate such danger Ferguson modified the operation by quilting together the peritoneal surface external to the point transfixed by the loop of round ligament. This ligature, when tied, closes up the gap in the peritoneal cavity external to the point through which the loop of the ligament is brought out. With these parts secured, the uterus is held forward by a loop of the strongest part of the round ligament. (Fig. 424.) Simpson, through a median incision about one inch from the uterus, passed a suture through three-fourths of the round ligament, threaded both ends of this suture into a carrier, and through the slit made in the anterior layer of the broad ligament passed it directly forward beneath the peritoneum of the vesico-uterine pouch to a point upon the anterior abdominal wall one and one-half inches external to the median line, and carried both ends into the peritoneal cavity. One end threaded into a sharp curved needle

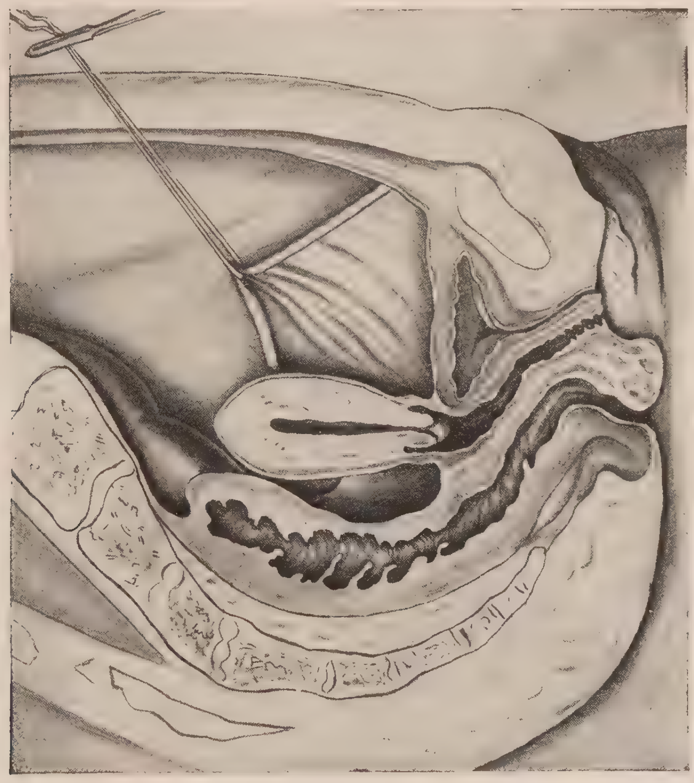


FIG. 425.—First Step in My Modification of the Gilliam Operation for Securing Round Ligament Support.

and thrust into the muscular structure, emerged upon the peritoneum, where it was secured by tying with the other end. I have combined the Simpson and Gilliam operation as follows: A curved incision, when possible, within the pubic hair line is made through skin, superficial fascia, and aponeurosis. The aponeurosis is loosened from the pyramidalis muscles and drawn upward (see Figs. 150 and 151), the recti muscles separated, and the peritoneum divided in the vertical line. After freeing adhesions and giving proper attention to the condition of the ovaries and tubes, a suture is passed beneath each round ligament, one inch and a half external to the uterus. (Fig. 425.) The ends of the suture upon one side are threaded into the eye of a Deschamps needle having a rather long arm. (Fig. 426.) The round ligament external to the suture is seized with a hemostat and given to an assistant with the direction to keep it taut. An opening is made into the anterior layer of the broad ligament, just below the insertion of the suture, and through this opening the needle carrying the ends of the suture is introduced and carried outward between the layers of the broad ligament until the parietal peritoneum is reached, when the

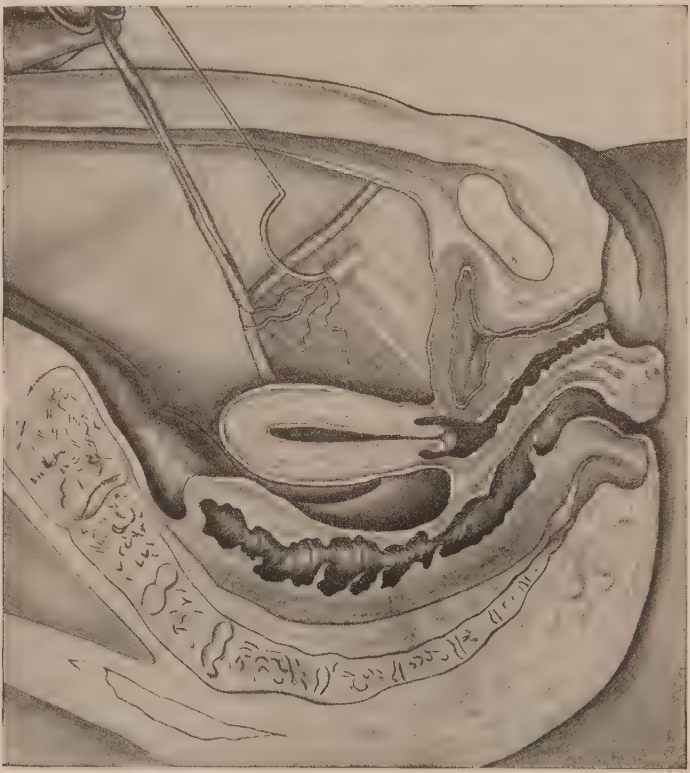


FIG. 426.—Second Step, Showing Ligament Fixed with Hemostat while Temporary Ligature is Carried Beneath Anterior Leaflet of Broad Ligament with a Deschamps Needle.

latter is drawn inward and the point of the instrument plunged through the abdominal parietes, emerging upon the aponeurosis. The suture ends upon each side are withdrawn from the Deschamps needle, and secured by a hemostat. Seizing the suture upon one side and drawing upon it to make it tense, a pair of pointed scissors, closed, is thrust alongside the ligature and the blades separated, when, in the majority of cases, the traction causes a loop of the ligament to follow the withdrawal of the scissors. Where it does not at once follow, it can be teased through by pressing back the tissues as traction is being made. (Fig. 427.) Having thus brought a loop of each ligament through the wall, the loop is secured to the aponeurosis by catgut sutures. Previous to securing the protruded loop see that the uterus is in proper position. If it is not, the portion of ligament next to the uterus can be pulled upon to the necessary degree to accomplish the object. The ligaments secured, the wound is closed by a continuous chromic catgut suture in the peritoneum and muscle edges. This suture should be drawn over firmly enough to hold in apposition the peritoneal surfaces and not strangulate the muscle structure. A second suture

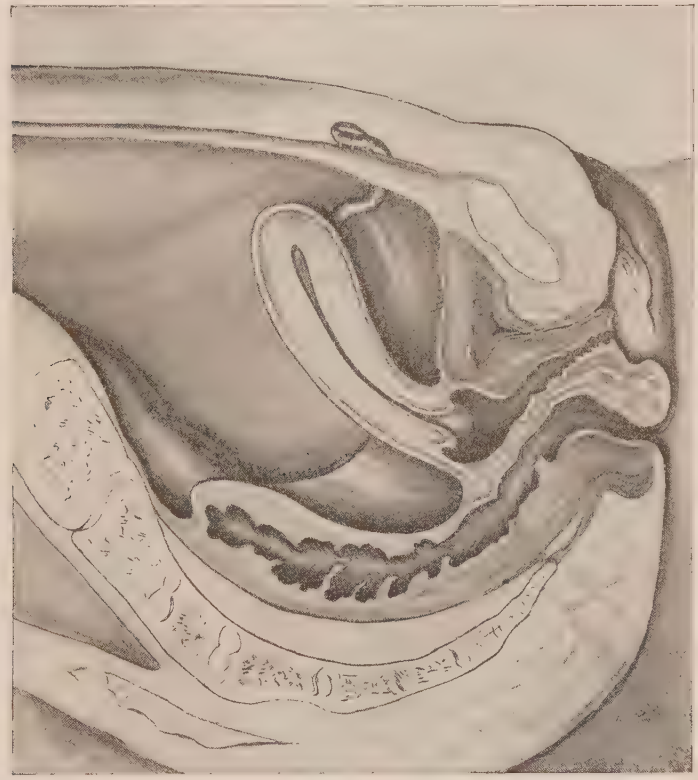


FIG. 427.—Operation Completed; Differs from Gilliam-Ferguson in Having No Internal Sutures.

closes the aponeurosis and a third the skin surfaces. The greatest care must be exercised to prevent the accumulation of blood above or beneath the aponeurosis, for such an accumulation is readily infected and the formation of an abscess will result in a weakened ventrum—possibly in sloughing of the aponeurosis. Bleeding vessels should be ligated, and where there is a tendency to oozing, drainage should be employed. This method of treatment possesses the advantages that: 1. It affords ample opportunity for the recognition and treatment of diseased conditions of the pelvic structures; 2. No opportunity is added by the operation for the formation of disturbing pelvic adhesions; 3. The natural condition is more closely imitated and the uterus maintained in position by ligaments capable of evolution and involution.

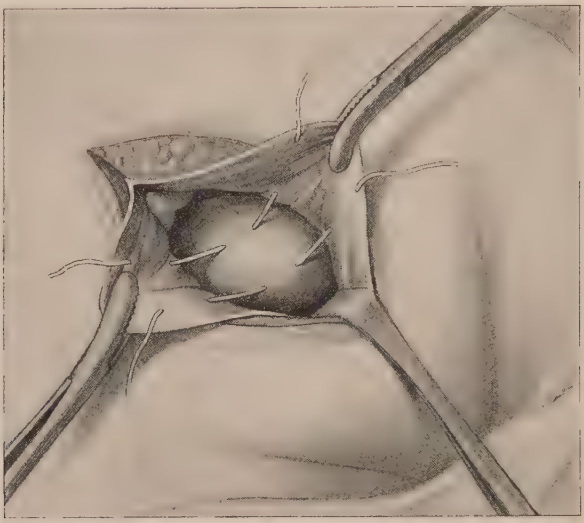


FIG. 428.—Sutures Introduced for Ventrosuspension.

Ventrofixation and ventrosuspension are terms applied to the operation devised by Olshausen, and modified by Kelly, for establishing an artificial ligament for the purpose of maintaining the uterus forward. The operation consists in an incision in the median line, through which the uterus is exposed and its fundus sutured to the parietal peritoneum at the lower angle of the wound. Generally two or three buried sutures of silk, silkworm-gut, catgut, or silver wire are used. (Fig. 428.) The first suture is passed through the peritoneum about one centimeter from the wound margin, through the fundus uteri near its center, and brought out through the peritoneum of the opposite side of the wound. A second suture is similarly placed about eight millimeters behind the first. To prevent the peritoneum from being dragged away from the abdominal wall it is included in the abdominal suture. Since the first edition of this book I have modified my method of performing this operation by introducing a silkworm-gut suture through the fundus of the uterus and the abdominal walls, which is subsequently tied externally. A needle, carrying a chromic catgut suture, is introduced through the aponeurosis of the lower angle of the right side, through the fundus of the uterus, near the silkworm-gut suture, and brought out through the peritoneum of the opposite side. Two subsequent turns of the suture are passed through the edges of the peritoneum and the fundus of the uterus, after which the peritoneal wound is closed with the remaining suture. Following the introduction of silkworm-gut sutures through all the tissues above the peritoneum, this same catgut suture is carried back through the aponeurosis and tied at the lower angle of the wound. Therefore the uterus, peritoneum, and aponeurosis are all held by the one suture, and only a single buried knot remains in the incision. The silkworm-gut sutures (including the one through the fundus uteri), are then tied, which would bring in apposition and secure the skin edges. The stay or lower suture of silkworm-gut may be tied over a pledget of gauze to prevent cutting the skin, and should be permitted to remain for two weeks. This operation establishes between the uterus and parietal peritoneum, a ligamentous band which is sufficiently strong to maintain the uterus forward and yet not interfere with its mobility. Where it is preferable—as, for instance, after the climacteric, or in patients from whom both ovaries have been removed—that the uterus should be more firmly fixed to the abdominal wall, it is better that the peritoneum should be pushed back so that the sutures bring the muscle structure directly in contact with the fundus of the uterus. Such a course secures a firmer union and, therefore, the uterus is held more closely to the parietal wall. The procedure we have described permits thorough exploration of the pelvic cavity, the separation of adhesions, and the fixation of the uterus through a single incision. The procedure has been greatly modified. By some, the sutures are placed in the anterior uterine wall. The majority of operators insert them in the fundus—the first suture in the line of the Fallopian tubes, and the second a little behind it, thus throwing the uterus forward in slight anteflexion. The purpose of the operation of ventrosuspension is to establish a ligamentous union, which will permit a certain amount of uterine mobility. Consequently the uterus is attached only to the peritoneum, rather than to the muscle wall. To avoid the buried suture, F. Martin has suggested using the urachus, and when it is not well defined, a loop of peritoneum is carried from below upward through a buttonhole slit in the fundus and included in the sutures closing the wound. Bovèe employs a portion of muscle aponeurosis. These modifications, however, have no special advantage. The fixation has been accomplished through a transverse incision above the symphysis. This incision only divides the skin and superficial fascia. A vertical incision is then made through the aponeurosis, muscle wall and peritoneum. The uterus is brought forward and secured by two silkworm-gut sutures through the fundus. These are brought out through the muscle wall and segment of integument below the transverse incision. The remaining portion of the vertical wound is closed with catgut and the transverse incision in the skin with a continuous intercuticular stitch of silk. The suspensory stitches are tied over a gauze roll and permitted to remain two weeks. Ventrosuspension has the advantages already suggested, that it permits the inspection of the condition of the peritoneal cavity, the treatment of diseased appendages, the separation of adhesions, and the fixation forward of the uterus in a position which is unlikely to give distress.

It has the following disadvantages: 1. It has been found to interfere to some degree with subsequent gestation and labor, the patient complaining of more or less pulling and distress during the progress of gestation. Sometimes this is so marked as to cause abortion or premature labor. When the band of fixation is short, large, and firm, it may prevent enlargement of the uterus and produce thinning of the posterior wall, which will increase the danger of rupture and afford obstacles to the normal progress of parturition. A firm band of adhesion, during pregnancy, after the performance of ventrofixation, may cause a condition simulating a bifid uterus. I have, in several instances, opened the abdomen during pregnancy and cut the band in order to permit the uterus to develop properly. Furthermore, I have seen patients in whom I felt that such a procedure was advisable. In one instance I was called in consultation to see a woman who had had a ventrosuspension performed and who was in labor at full term. The anterior wall of the uterus and cervix were apparently doubled up, forming a shelf upon which the fetus rested with an arm protruding. The attendants, after vigorous efforts to turn the child, had cut off this arm. The fetus was lying in a transverse position, and a part of the body had engaged. After considerable difficulty I succeeded in passing a cephalotribe upon the body of the child, with which I crushed the spine and delivered first the lower extremities, and then the trunk and head.

2. The operation is not free from danger. I had the misfortune to have one patient in whom a large portion of intestine slipped below the band of adhesion immediately following the operation. This became strangulated and caused death. Similar cases have been reported by Lindfors, Jacobi, Olshausen, and others. The accident in my case occurred almost immediately after the operation, and, although the patient suffered greatly, it was attributed by her attendants to hysterical excitement following the anesthetic, and, when recognized, the condition of the patient was such as to preclude any hope of recovery. It would not require great imagination, when one sees these bands of adhesion, to appreciate the possibility of strangulation occurring at periods more remote from the operation, and numbers of such instances are recorded.

3. The buried sutures of silkworm-gut, silk, or silver wire may become a source of irritation, either from immediate infection or later inflammatory changes, and cause a sinus to extend through the abdominal wall and give rise to an unpleasant discharge. Such a sequence, of course, annoys both patient and surgeon until the offending cause—the buried sutures—have been removed or have become disintegrated. Such a sinus may keep up for months or even years. The sutures can occasionally be fished up and removed. For this purpose I know of no instrument better adapted than the hook of the ear-spoon devised by the elder Gross

for the removal of hardened wax from the ear. If this instrument is ineffective, the surgeon may find himself obliged to reopen the wound. Frequently the offending ligature will be found deep in the pelvis, at the end of a band of adhesion. To avoid this difficulty I have employed the chromic catgut suture with a single knot.

Burrage has advised ventrofixation for the treatment of immobile anteflexion. Through an abdominal incision he divides the uterosacral ligaments close to the uterus and secures the fundus to the abdominal wall. Schmidt, of Cologne, frees the anterior uterine wall from the bladder by dissection, excises a wedge-shaped piece with its point directed toward the cervical canal, and unites the surfaces by sutures. This draws the uterus forward in a position of anteflexion.

Vaginal Operations. The ease with which the pelvis can be entered through the vagina has led to the adoption of various operative procedures through that canal to hold the uterus forward. One of the earliest operations performed through the vagina is known as the Schücking. This consists in passing an instrument, curved, for an acute anteflexion, to the fundus, from which a concealed needle is driven through the anterior vaginal fornix. This needle carries back a ligature, which, when tied, fixes the uterus in a position of anteflexion. Care must be taken to push the bladder to one side to avoid injuring it. Injury of the intestine has also occurred. The ligature is permitted to remain for two or three weeks, when the resulting inflammatory changes will fix the uterus in anteflexion. The procedure is objectionable in that it is a blind operation, and injury, therefore, may be unavoidable. Instruments have been devised to push the uterus against the anterior abdominal wall and thrust needles carrying ligatures from its cavity by which the fundus can be fastened; but these are open to the same objection. They are blind procedures.

Vaginal fixation devised by Dührssen, subsequently practised and modified by Mackenrodt, consists in making a vertical incision through the anterior vaginal wall to the cervix, when the bladder is pushed off until the peritoneum is reached. Without opening the latter a suture is introduced, and by it the uterus is pulled forward. A second suture, placed higher, near the fundus, is employed to maintain the uterus forward by bringing its ends through the edges of the vaginal incision. Mackenrodt modified the operation by opening through the peritoneum and introducing the sutures at a higher level, thus securing the fundus or anterior wall to the vaginal incision. The peritoneal and vaginal wounds were then closed. This operation was very largely practised for a time, but it soon was recognized that it was likely to cause much distress and discomfort during the progress of gestation. Moreover, it often produced profound dystocia, which imperiled the lives of both mother and child. For these reasons the operation is practised rather infrequently now. Vineberg and Wertheim, through a similar incision, seize the round ligament some three centimeters from the fundus uteri, pass a ligature beneath it, and bring the ends of this ligature out through the vaginal walls on either side of the vertical incision. The ligature is then tied. This holds the round ligament down against the vagina, and, consequently, fixes the uterus forward. The round ligaments also have been shortened through the vagina by performing the Wylie or Mann operation upon them. I have sutured the round ligaments to the anterior surface of the uterus through the vaginal opening. The operation of Ries consists in pulling a loop of the round ligament through a slit in the anterior wall of the uterus. This method has been described under abdominal procedures, but was devised to be performed through the vaginal incision. Through a posterior colpotomy by a vertical incision, Freund and Gottschalk shortened the uterosacral ligaments. The incision was made from just behind the cervix downward, toward the rectum. The peritoneal cavity was opened and a ligature introduced on each side to separate the surfaces. From this opening a ligature was carried through the middle of the uterosacral ligament, and one end of it through the posterior surface of the cervix. The ligature thus introduced on each side was tied, which drew the cervix upward and backward. Consequently the other end of the lever, the fundus, was thrown forward. A modification of this procedure has been extensively practised by Bovée, of Washington, who is an enthusiastic advocate of it. He shortens the ligament without opening the peritoneum. Pryor advocated a transverse incision in the posterior fornix of the vagina, through which he broke up adhesions, carried the uterus forward, and packed gauze into the posterior cul-de-sac. Then with a tampon he pressed the cervix well upward and backward. The subsequent adhesion of the cervix in this position leads to correction of the malposition.

264. Lateral Flexion. Lateral uterine bending may be dextroflexion or sinistroflexion. The position of the cervix is more or less fixed and the fundus of the uterus is drawn to one side by cicatricial contraction, or is pushed to the opposite by a large exudate, an intraligamentary fibroid growth, or an ovarian cyst. No special symptoms characterize the state; the diagnosis is readily determined by the methods already cited for the determination of other forms of displacement.

265. Complications Associated with Displacements. It has been noted, in discussing the individual forms of displacement of the uterus, that they rarely produce symptoms themselves, and, when it is considered that the organ involved, in its normal condition, weighs less than an ounce, that its circulation is so extrinsic that the organ can be bent forward or backward without injury thereto, it is difficult to see why so much stress has been placed upon these displacements.

The development of a complication, however, by which the circulation is obstructed, changes the whole aspect of affairs. The most frequent complications of uterine displacements are:

Endometritis.
Metritis.
Salpingitis.
Oöphoritis.
Cellulitis.
Peritonitis.

Other complications are:

Ectopic gestation.

Ovarian or myomatous tumors.

Ptosis of the abdominal viscera.

These complications are most frequently primary as regards the production of symptoms, though, as in prolapsus, they may be secondary in the sense that the displacement lessens the resistance to infection.

Prognosis of displacements will depend upon their degree and the existence of complications. In the earlier stage of the displacement, when the distress arises from increased weight of the organ, the mere correction of the position and the maintenance of the organ corrected will bring about a decrease in its size and afford relief. After the displacement has existed for some time, it is complicated by chronic inflammatory changes, which will absolutely prevent any procedure from maintaining the organ in its proper position. The symptomatic phenomena, however, can be relieved and the patient practically restored to health.

General Treatment. It will be seen, from a discussion of the different forms of displacement, that I am disinclined to believe that uncomplicated displacements are likely to produce symptoms. Of course, I can readily understand that when a patient has prolapsus, with the uterus protruding from the body, it necessarily produces disturbance and is subject to unusual irritation from its abnormal location. The small size of the uterus, when normal, and the manner in which it receives and discharges its blood-supply, render it difficult to conceive how the mere displacement of so movable an organ should be provocative of the serious symptoms which frequently have been attributed to it. The most frequent complications of uterine displacement are inflammatory processes and their sequelæ, which cause increase in the size of the organ, its fixation by extensive adhesions, and interference with the performance of the function of the adjacent viscera. The treatment, then, must largely consist in the correction of the existing complication. Experience has disclosed, however, that when such complications exist, their treatment is most effective when associated with measures directed to maintain the uterus in proper position. The methods of procedure most effective to accomplish this purpose are both local and constitutional, such as massage, electricity, and mechanical procedures. The patient should be suitably clad, and wear clothing free from undue constrictions about the waist. Her skirts should be supported from the shoulders. The bowels should be regulated carefully, and the bladder not permitted to become overdistended. Peri-uterine inflammation and extensive exudates can be ameliorated and absorption expedited by the employment of pelvic massage. This is best performed by a daily séance of five to ten minutes or more, after the more severe distress and pain have been relieved. Occasionally the vault of the vagina may be painted with tincture of iodin, and in the intervals between the massage, tampons, medicated preferably with an antiseptic solution containing glycerin, should be worn. The tampon maintains the uterus at a higher level, promotes the absorption of exudation, facilitates involution, and thus favors its maintenance in a normal position. Vaginal douches, hot rectal enemas, hot sitz-baths, or the application of heat over the abdomen or pelvis in the form of hot sand or a peat bath will be found beneficial. Pressure over the abdomen, particularly where a mass of exudate is recognized, will promote its absorption. This action oftentimes causes such an exudate to melt entirely away. Pressure can be effected by the use of a shot bag, by which three to five pounds or more of shot are retained over the affected surface. When the uterus is freely movable or the adhesions have been absorbed, the organ can be maintained in its proper position by a suitable pessary. It should, however, be recognized that the uterus must be replaced in its proper position first. The pessary does not act as a corrective agent, but only as a crutch to support and maintain the uterus in its corrected position. Pessaries are generally made of soft and hard rubber, sometimes of wire coated with soft rubber. Soft-rubber instruments absorb the discharges from the vagina, decompose, become exceedingly foul, and cause a very disagreeable odor. While the pessary is worn it is important that the vagina should be irrigated daily. Solutions of the inorganic salts should not be employed for irrigation, as they deposit upon the surface of the pessary, cause it to roughen, and thus lead to abrasion and ulceration. The pessary must not be either unduly large or too small. An overlarge instrument makes pressure, causes ulceration, and the formation of granulations, which may envelop the pessary and finally cause it to become embedded in cicatricial tissue. Too small an instrument permits the uterus to fall back over it or the pessary itself to twist around and thus prevent its being of any service.

Summary. In anteversion and anteflexion of moderate degree constitutional measures to improve the general health, the regulation of the secretions, enforced rest during menstruation, with dilatation, curetment, and the establishment of proper drainage will be means sufficient to establish a symptomatic cure. Generally when anteflexion is acute and dysmenorrhea is marked, curetment will generally be of only temporary benefit and should be followed by splitting the posterior lip and suturing the surfaces, as advised by E. C. Dudley, or the insertion and retention of a Wylie drain. Retroversion and retroflexion are capable of producing marked influence upon the general health, but should not be considered as indicating the practice of special procedures unless they are productive of symptoms. The correction and maintenance of the proper position of the uterus is indicated as a preliminary treament of any complication, and retroversion, associated with recent subinvolution, unless complicated by perimetritic adhesions, should be considered an indication for the use of the pessary, provided the organ can be replaced. Where the pessary is not well borne in retroflexion and the uterus freely movable, the Alexander operation may be employed. The great frequency with which inflammation and more or less adhesion of the uterus occurs greatly limits the number of cases to which this operation is applicable. I would prefer to make the median incision, for it permits thorough examination of the pelvic viscera, existing adhesions to be separated, and diseased conditions of the ovaries and tubes to be treated. The great majority of operations for shortening the round ligaments within the abdomen utilize the strongest portion of the ligament and leave its weakest part undisturbed, with the probability of a redevelopment of the displacement. The modification of the operations of Gilliam and Simpson, which I have devised, seems to me the most desirable, as it accomplishes all that the Alexander operation could do. Moreover, it has the advantage over the operation of ventrosuspension in that it affords no opportunity for the formation of adhesions to serve as a trap by which a knuckle of intestine may become fixed and obstructed. My experience leads me to the performance of the operation known as ventrosuspension or ventrofixation less and less frequently. Of the vaginal operations, the ones pursued by Vineberg and Bovée are the most serviceable. The other vaginal operations have proved unsatisfactory, for many of the patients thus operated upon have experienced trouble during subsequent pregnancy. Prolapsus uteri is a condition which should receive early consideration. The longer the displacement is permitted to remain unantagonized, the greater are the chances that it cannot be completely restored. The first stage of uterovaginal prolapse can be corrected by the employment of a suitable pessary. One should be employed which will maintain the uterus in a position of anteflexion or anteversion. The early stage of vagino-uterine prolapse should be considered an indication for the prompt retraction of the relaxed vaginal walls and the restoration of the perineum. The accompanying cystocele should be treated by an excision of the redundant vaginal portion of the septum. This surface should be sutured in a transverse direction in preference to the suture that is sometimes advocated, known as the Stolz suture, which shortens the vagina in every direction. The importance of having a long anterior vaginal segment is seen in its influence in maintaining the cervix at a higher level, consequently throwing the fundus forward. In the later stages of prolapsus the vaginal plastic operation should be supplemented by an abdominal procedure to maintain the organ forward. This may be accomplished by shortening of the round ligaments and of the uterosacral. When the latter are so extenuated as to render them unserviceable, the cervix may be held back by a suture on either side starting at the beginning of the broad ligament at the brim of the pelvis and follows the posterior surface of the broad ligament at intervals until it reaches a point posterior to the cervix in Douglas' pouch before it is tied.

After the climacteric, especially when the uterus shows a marked tendency to descent, fixation of the organ is desirable. In very extensive prolapsus or in elongation of the supravaginal cervix the fundus uteri should be amputated, and the stump can then be secured to the upper part of the broad ligament or to the anterior abdominal wall. Very frequently the condition will be complicated by an extensive hernia through Douglas' pouch. Then an extensive vaginal plastic operation, combined with a ventrofixation, will not necessarily prevent the development of this condition. The hernia may be obviated, however, by suturing together the fold of Douglas over the rectum and the remaining part of each fold to the side of the rectum. Enteroptosis may be still further prevented by fastening the colon to the abdominal parietes. My experience has led me to condemn the Freund operation as one of no value.

264. **Inversion of the uterus** is a condition in which the peritoneal and mucous surfaces are reversed, the latter covering a tumor situated in the vagina. Inversion can be partial or complete and presents three different forms. In a partial inversion the body of the organ is depressed and inverted until it reaches the cervix, but without dilating the latter. It is known as *inversion intra-uterine.* (Fig. 429.) Next, the fundus protrudes through the cervix, the uninverted portion of the latter forming a cuff at the upper part of the vagina. This is *inversion intravaginal.* (Fig. 430.) In the third form the entire uterus is inverted, and frequently the vagina with it, the uterus hanging outside the vulva. This is *inversionextravaginal.* (Fig. 431.)

Now in each form of inversion there may be combined a partial or total inversion of the vagina, so that the view that the third form only is necessarily combined with prolapsus is unjustifiable. A trifling degree of inversion or partial turning in of the uterus is called *invagination.* This may be a mere depression, over which the mucous surface becomes convex, while the peritoneal surface forms a depression or concavity. As this depression continues, the proximity of the tubes and round ligaments to the ligamentum ovarium draws these structures into the opening. The ovaries may rest upon the funnel-shaped depression, while the tube is necessarily, for a part of its extent, drawn into the cavity. The cavity, with its enlarged opening in the peritoneal cavity, is called the inversion funnel. Usually this funnel is not quite the depth of the ordinary length of the uterine cavity. If the inversion continues for some time, secondary

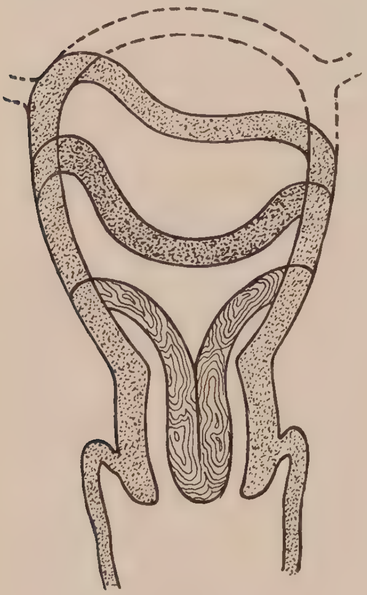


FIG. 429.—Partial Inversion of the Uterus, Showing Three Degrees.

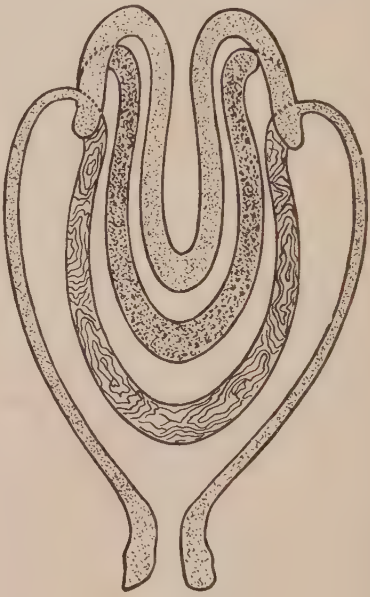


FIG. 430.—Intravaginal Inversion; Three Degrees.

phenomena result, from retrogressive processes, but the uterus returns to its normal size. The inverted mucous membrane is covered with epithelium; the neck of the uterus is small, generally surrounded by a cuff of tissue—a cervical ring—derived from the cervix, which has not been completely inverted. The longer the inversion exists, the more considerable is the congestion. Edematous enlargement, and thickening form the misproportion between the narrow inversion funnel and the enveloping cuff of the cervix. We not infrequently find diseases of the adnexa. The orifice of the tube situated in the vagina readily can be the avenue for the passage of infection into the deeper structures. The uterine inner surface of the tubal mouths is exposed, the projecting mucous membrane is frequently rubbed and irritated, so this door stands open for the entrance of germs, and infection can take its way through the tubal mucous membrane or by the lymphatics to the deeper tissues, producing endosalpingitis, suppurative processes in the ovary, or purulent pelvioperitonitis by extension

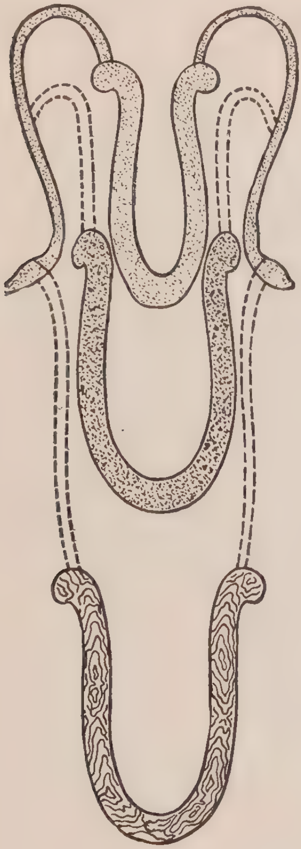


Fig. 431.—Extravaginal Inversion; Three Degrees.

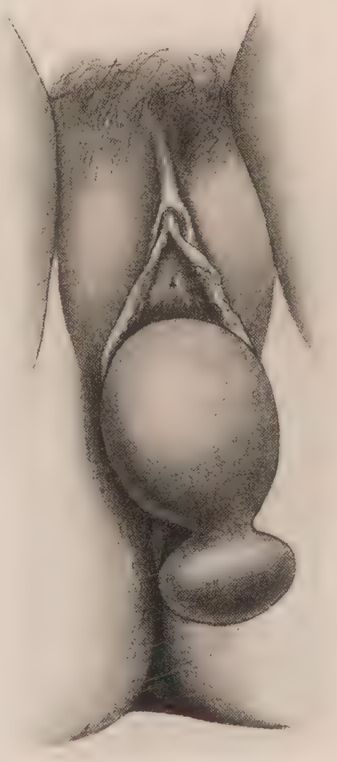


Fig. 432.—Nonpuerperal Inversion Fibroid Tumor Attached to the Fundus Uteri.

of infection from the connective tissue. In ordinary conditions we can have involvement of the cellular tissue from such infectious processes. Alterations in the peritoneal covering of the inversion funnel occur, which render the condition more or less fixed.

Etiology. Inversion generally arises from two causes: 1. From puerperal conditions, relaxation, or partial paralysis of the uterus during the process of labor, especially the third stage of labor; and, 2. The nonpuerperal form, in which the uterus is displaced by the presence of a fibroid tumor attached to the fundus. (Fig. 432.) These two conditions are very much alike in the clinical form of an inversion, but are very different in their manner of development. Puerperal inversions are much more frequent than those which arise from the presence of growths. They are in the proportion of nine to one. Total inversion is rare. How much more frequently the partial form occurs is difficult to determine, as often partial inversion resulting from the presence of growths is overlooked. Puerperal inversion, in some cases, is produced by traction upon the cord in the efforts to deliver the placenta. By faulty pressure over the uterus the fundus may be inverted, and in the paralyzed condition may be grasped by the deeper structures and the inversion progress until it is completed. A short cord is an occasional cause for inversion. The traction is made upon the cord at a time when the uterus is relaxed and least resistant. Traction upon the fundus and subsequent uterine contraction very rapidly complete

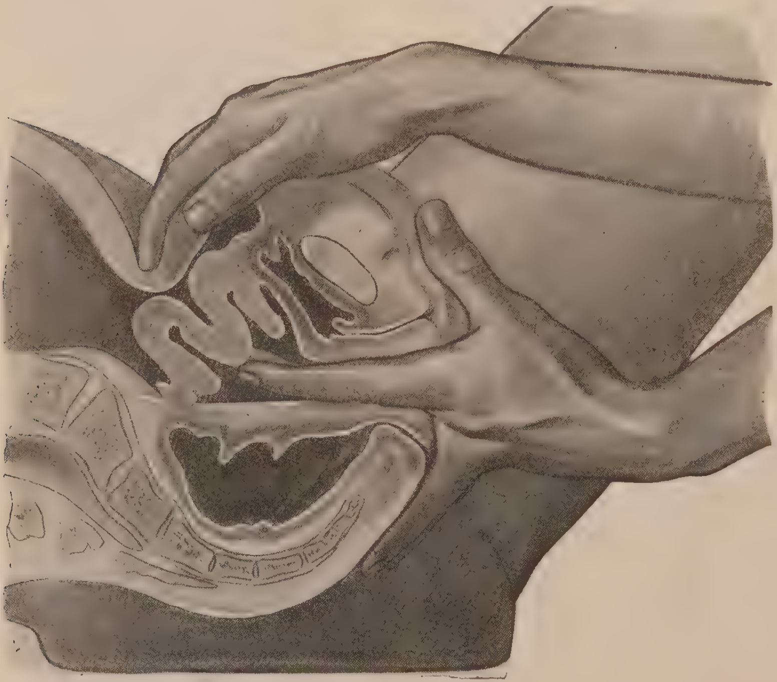


FIG. 433.—Palpation of an Inversion of the First Degree.

the displacement. Inversion rarely occurs spontaneously. Overdistention of the cervix by a large fetus frequently causes such relaxation as will permit inversion to occur readily. It will be a matter of interest to know whether, in the cases in which inversion has occurred, the placenta has been attached near the fundus of the uterus.

Symptoms. Inversion causes characteristic symptoms. The patient generally complains of severe pain, which is continuous, sometimes for days; sometimes a pulling sensation is felt in the vagina. Immediately following the dislocation a severe hemorrhage occurs. This continues in noteworthy strength the first day of the puerperium. It does not completely disappear, but may continue much longer. Later, it appears intermittently, but the suspension of discharge rarely corresponds in its duration to the normal intermenstrual interval. During the interval there is a profuse mucous discharge from the genitalia. The profuse blood discharge may cause the death of the patient from acute anemia, or it may occur later from septic infection. In some cases spontaneous

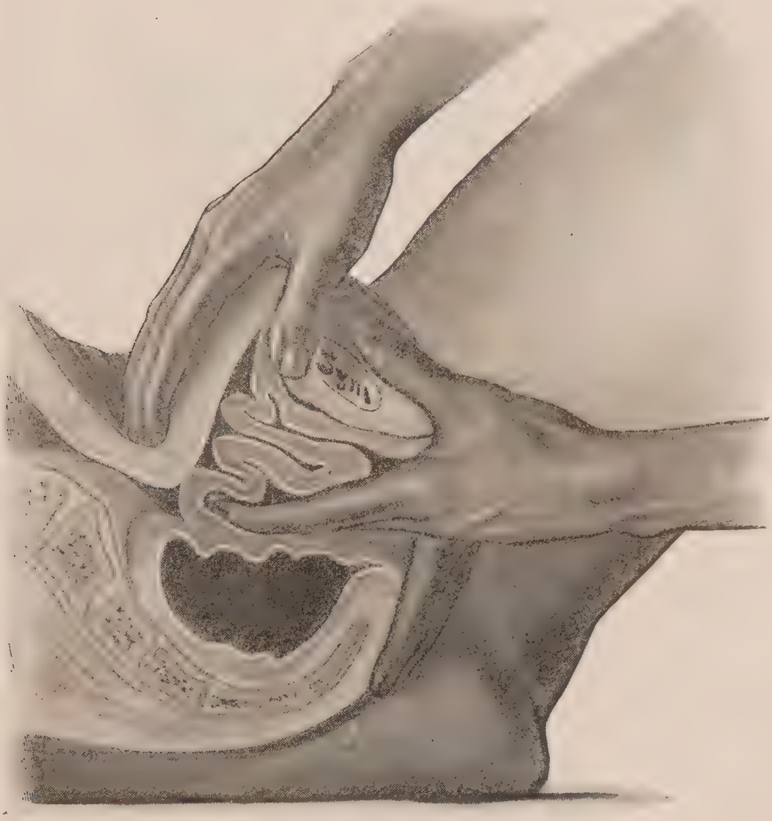


FIG. 434.—Palpation of an Inversion of the Second Degree.

reinversion has taken place in the course of the year. The condition may be suspected from these phenomena.

Diagnosis. Inversion will be suspected from the severe pain, the more or less continuous hemorrhage, and the absence of the fundus uteri when the hand is placed upon the abdomen. Digital examination discloses a globular mass which fills up the vagina and is encircled by a cuff-like ring at its upper part. This ring is situated at the external os. (Fig. 434.) Placing the hand over the abdomen and making deep pressure, the fundus of the uterus is found to be absent from its normal situation, and, instead, a funnel-shaped excavation is recognized, which is ordinarily sufficient to determine the diagnosis. (Fig. 435.) In the chronic condition the uterus resumes its normal size, presents a globular or pear-shaped mass in the vagina, surrounded at its upper part by a distinct cuff or ring, and the sound will pass into this the same distance on all sides. Bimanual examination discloses above a funnel-shaped depression. This depression can be determined more readily by drawing upon the fundus of the uterus and introducing the finger into the rectum, when it can pass over the neck and directly into this funnel. The ovaries and tubes are recognized near or

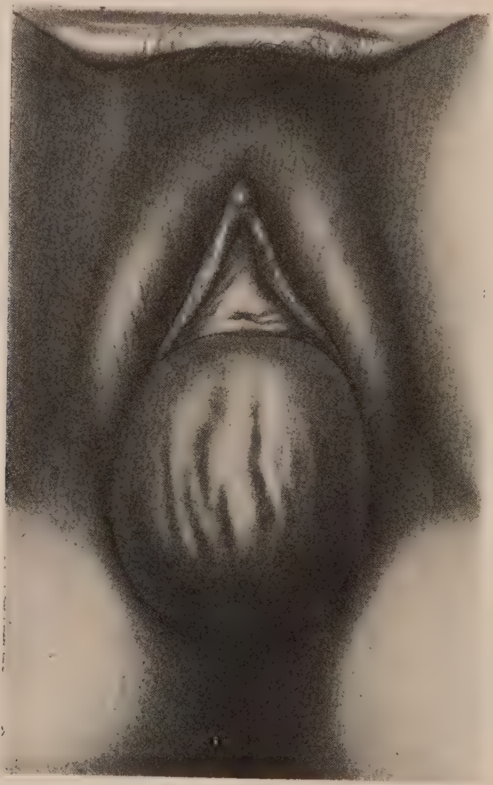


FIG. 435.—Appearance of Inversion of the Third Degree.

upon its margin. The speculum shows the vaginal tumor smooth, glistening, and highly reddened. Sometimes at its lower angles the openings of the tubes can be recognized. While a vaginal examination may afford a suspicion of the character of the disorder, the diagnosis is incomplete without a bimanual investigation which involves the rectum and belly cavity. When the abdominal walls are very thick and palpation is not determined readily, the introduction of a sound or a catheter into the bladder and of a finger into the rectum will determine definitely the presence or absence of the uterine body. Inversion of the uterus is sometimes confounded with fibroid polypus which has been extruded into the vagina. (Fig. 436.) A fibroid polypus may have a broad-based pedicle and the tumor may present a shape very similar to that of an inverted uterus. As it is covered with mucous membrane, the superficial similarity may be marked. Of course, a fibroid tumor will show no orifice of the Fallopian tubes, but the latter are not always distinguished. Sensation in the fibroid is a little less marked than in the inverted uterus, but is not sufficiently definite to afford a foundation for diagnosis. The sound carried around the cuff of the inverted uterus passes on all sides an equal distance. With fibroid tumor it would pass into the uterine cavity at one side. (Fig. 436, *b*) Occasionally, however, the cavity of the uterus may be so stenosed that the sound will not enter, and the diagnosis may then be uncertain. (Fig. 436, *c*)

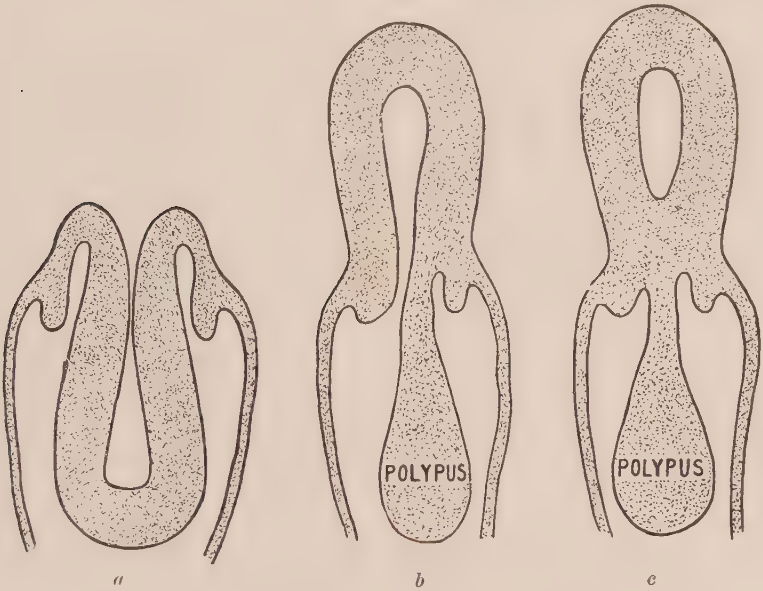


FIG. 436.—*a*. Inversion of the Uterus. *b*. Fibroid Polypus. *c*. Fibroid Polypus, with Stenosis of the Cervical Canal.

If we grasp the mass and draw it down, the finger in the rectum will disclose, in the one case, the cup-shaped depression of the inverted uterus; and, in the other the body of the uterus lying above the neck of the growth. In a partial inversion, associated with fibroid growth, we may not be able definitely to determine the condition until we proceed to operation for the removal of the mass. (Fig. 437.)

Treatment. There is a difference in the treatment of the two forms of inversion. In the puerperal condition all that is necessary is to replace the uterus, when it will remain, while in the nonpuerperal form it is necessary to remove the growths which have caused it. Re-inversion is comparatively easy immediately after the occurrence. Occasionally, the opening of the vagina with the patient in the genupectoral position will permit replacement by atmospheric pressure. Often pressure against the fundus with the hand or fingers in the shape of a cone will be sufficient to carry the hand directly into the cavity of the uterus and accomplish its complete re-inversion. When the inversion has existed for some time and has become chronic, various methods can be employed for replacement. These measures may be manual, instrumental, or operative.

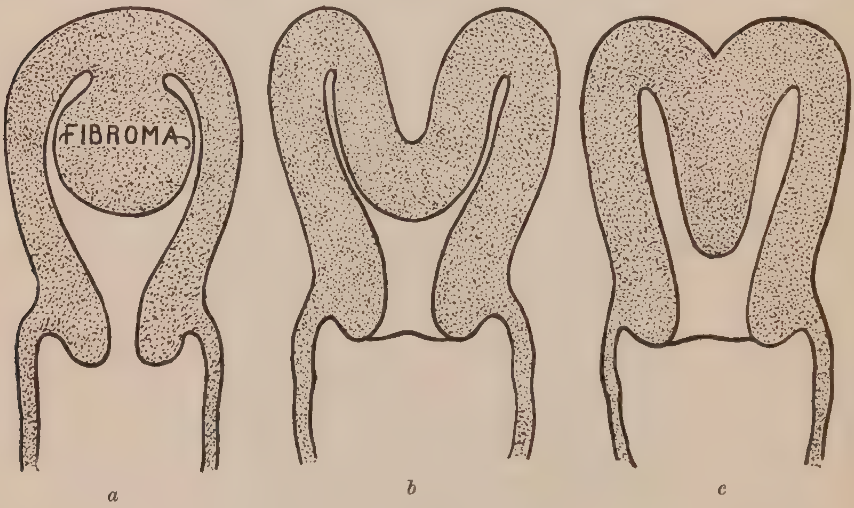


FIG. 437.—*a*. Submucous Fibroma. *b*. Partial Inversion. *c*. Partial Division of the Uterus.

The manual treatment consists of a veritable taxis on the inverted organ as in hernia, and both hands are necessary. The left hand over the abdomen supports the uterus, while the right replaces the inversion. Courty introduced one or two fingers into the rectum and hooked them over the end of the uterus which fixed it more solidly. The other hand was introduced partly or wholly into the vagina. Taxis is exercised in various directions; thus, it is central, lateral, or peripheral. Taxis is called central when the pressure is made against the fundus, or median part of the organ (Fig. 440); lateral, when it is exercised at the level of one or the other uterine cornu (Fig. 441); and peripheral when the pressure is exerted on the reflex parts (Fig. 442.) The latter is exemplified when the fundus is seized in the palm of the hand. The fingers pass to the fundus of the vagina and spread it out, stretching the funnel while the fundus is pushed against it. The procedure can be rendered more effective by traction on sutures inserted in the cervix from the vagina.

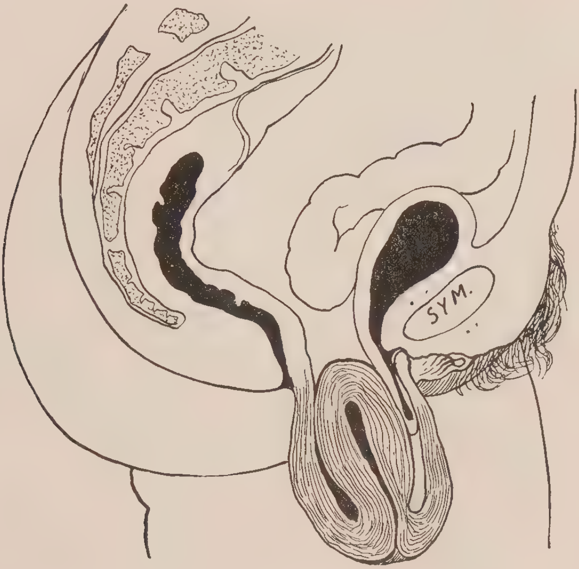


FIG. 438.—Prolapsus Uteri without Inversion.

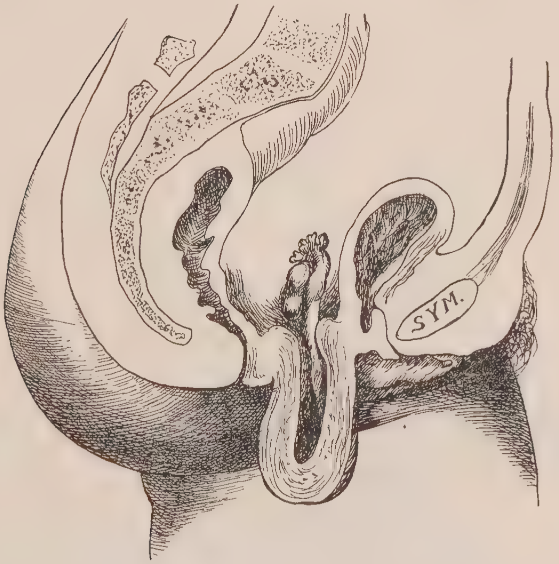


FIG. 439—Inversion of the Uterus—Extravaginal.

If taxis has been tried and found ineffectual, resort may be made to

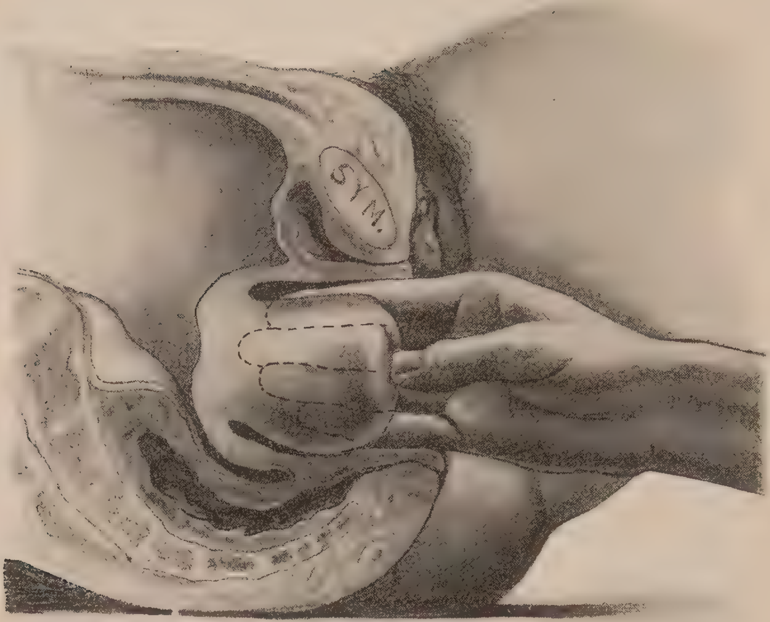


FIG. 440.—Central Taxis.

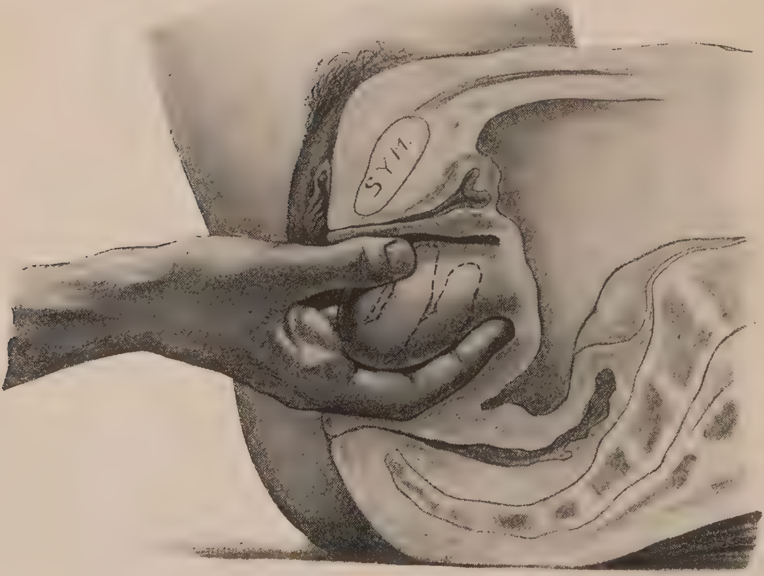


FIG. 441.—Lateral Taxis.

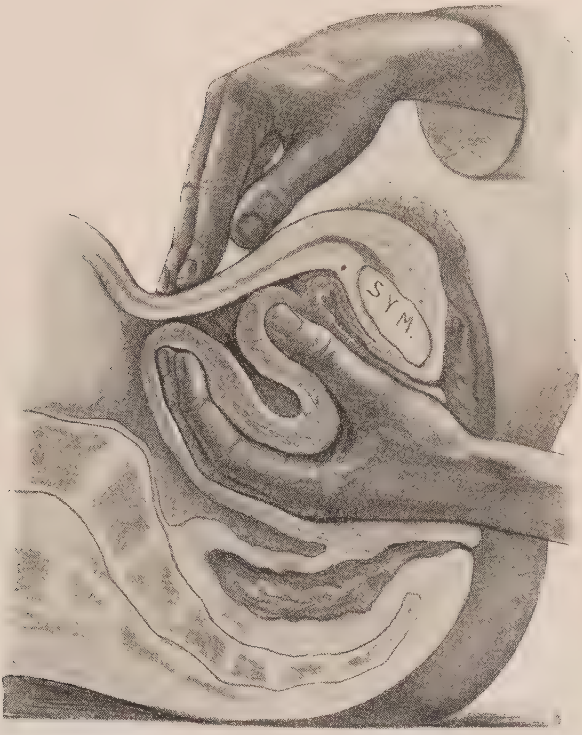


FIG. 442.—Peripheral Taxis.

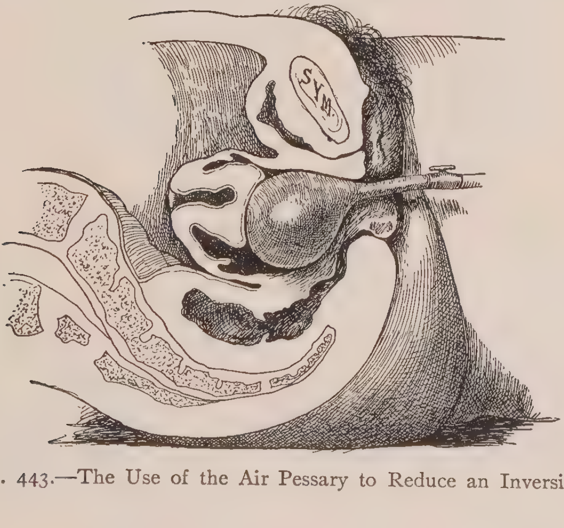


FIG. 443.—The Use of the Air Pessary to Reduce an Inversion.

instrumental reduction. A number of instruments for this purpose have been devised. The air pessary of Gariel introduced and distended exerts a hydrostatic or aërostatic pressure against the fundus and pushes it upward, while the vaginal walls, by their traction, pull apart the cervix. This soft pressure in some cases may be sufficient to accomplish the gradual reduction of the organ. The pessary can be introduced and a bandage so applied as to maintain the pressure against the crevix. (Fig. 443.) A vaginal tampon of iodoform gauze for twenty-four hours is sometimes more effective than the pessary. Pressure is sometimes employed against the fundus by an instrument with a cup-shaped end, into which the fundus fits. A spring upon its external surface induces an elastic pressure. (Fig. 444.) This procedure is more effective when combined with Marcy's suggested insertion of two or more ligatures in the cervix, by which traction can be made upon it, while pressure is made against the fundus. Thomas advised opening the abdomen and dilating the cervix with an instrument similar to a glove-stretcher, while pressure is made against the fundus. (Fig. 445.) This procedure was successful in one case and fatal in another. It has been suggested to introduce the index-finger of one hand into the rectum, and that of the other into the bladder, hooking them into the funnel-shaped depression of the uterus, while the thumbs are pressed against the fundus.

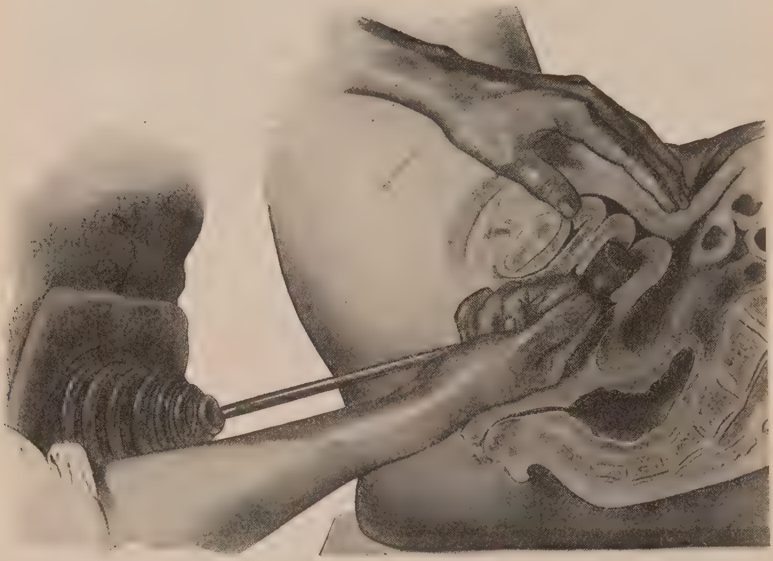


FIG. 444.—Reduction of Inversion with White's Apparatus.

Where the patient has passed through the puerperium the inversion can without doubt be accomplished with less traumatism by the procedure suggested by Küstner. This consists in a transverse incision into Douglas' cul-de-sac through the posterior fornix of the vagina through which the index-finger of the left hand is inserted into the inversion funnel. Re-inversion may be attempted with the thumb of the same hand against the fundus. As the procedure is rarely successful, it is better at once to split the posterior uterine wall, in the median line, by a longitudinal incision, to within two centimeters of the fundus when re-inversion will be comparatively easy as resistance has been removed. After the uterus has been re-inverted it can be drawn down and a number of sutures introduced through the vaginal opening which should then be closed. Hirst advises a cut through the vaginal portion of the cervix only.

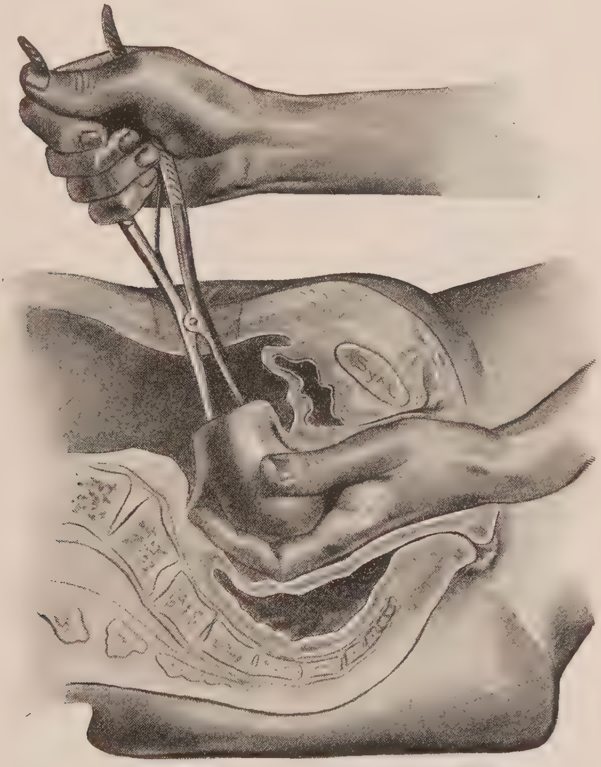


FIG. 445.—Intraperitoneal Dilatation of the Uterus.

If the inversion has existed for a number of years, it is questionable whether the changes in both mucosa and uterine wall are not such as to render of doubtful utility the retention of the organ when replaced. Then its removal should be considered advisable. The operation of hysterectomy should be done through the vagina and may be partial or complete. When limited to amputation of the fundus, precautions must be taken to guard against re-inversion of the stump with a resulting hemorrhage into the peritoneal cavity. By traction on the uterine body in the vagina its posterior surface is exposed, permitting a transverse section through the posterior cervical wall. The upper portion should be secured by traction sutures or double tenaculi. Through this opening the vessels may be secured with compression forceps, and the amputation completed. The vessels are secured by passing a ligature with a needle beneath them on either side and firmly tying it. The peritoneal surfaces of the stump should be united with chromic catgut sutures as a final step in the operation. Complete hysterectomy in such cases is readily performed by splitting the inverted uterus when the separation of the two halves exposes the ligament containing the vessels which can be ligated readily by passing a ligature under each half with a needle. The uterus is then removed flush with the vagina, the peritoneal surfaces united by continuous sutures, after which the vagina can be sutured.

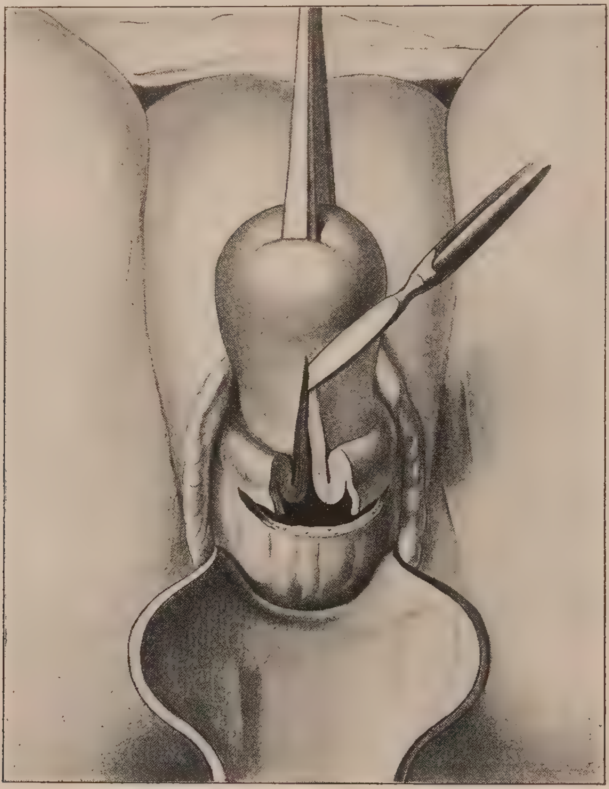


FIG. 446.—Incision of the Posterior Uterine Wall Preliminary to Reduction of an Inversion.

When the inversion is due to the presence of tumors, the operator may content himself simply with the removal of the growths and the re-inversion of the organ; or when the organ is very extensively involved, it may be necessary to remove the fundus with the growth. The possibility of partial inversion should always be kept in mind in operating upon partial extrusion of growths from the uterine cavity. Numerous cases are recorded in which a fibroid polypus or growth has been removed by the wire écraseur, and examination subsequently disclosed that a portion of the uterine wall was removed, causing an opening into the abdominal cavity. With growths projecting into the vagina, the preferable procedure is a careful enucleation of the tumor. The tumor is depressed and held while the enucleation is performed under the eye, so that, even though an inversion has occurred, by hugging the tumor closely we prevent breaking through the wall of the uterus.

267. Displacements of the Appendages. Displacements of the ovaries and tubes are very common with backward uterine displacement. Inflammatory troubles in the tubes cause them to drag lower from increased weight, and they are found behind the uterus in Douglas' pouch. (Fig. 447.) Frequently both tubes may be situated in this position, and, united at their abdominal ends, form a single tumor, which contains pus or serum. The tubes are dislocated by their attachment to growths; ovarian, fibroid, or broad-ligament cysts may draw the tube up into the abdominal cavity and almost double its length. The most frequent dislocation of the ovaries is downward, into Douglas' cul-de-sac. This prolapse can occur as a consequence of retrodisplacement, or, independent of it, from elongation or rupture of the infundibulopelvic ligament. The dislocation can be occasioned by enlargement of the ovary, or the hypertrophy may be secondary to the displacement. The complication of retrodisplacement with ovarian prolapse is a source of additional distress and annoyance to a patient, as the tender ovarian structures are subject to pressure from the heavy uterus and from the passage over them of the contents of the bowel. In this situation they are also

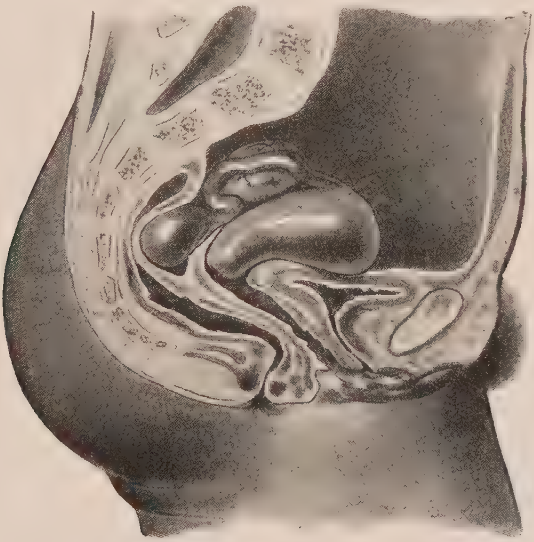


FIG. 447.—Prolapsus of Ovary and Tube behind Uterus.

subject to pain and distress during the act of coition, often rendering it so painful that the act is dreaded by the patient.

Symptoms. Prolapse of the ovary is generally associated with chronic inflammation, either as a primary or secondary condition. The symptoms from which the patients suffer are necessarily those which to some degree are occasioned by the chronic disorder. In addition to this fact, however, the patient suffers distress during fecal evacuation, during the act of coition, in walking, and on standing. The ache and distress are sometimes so severe as to render the patient unable to assume or retain the upright position; a condition of semi-invalidism from the influence upon the nervous system is engendered similar to that present in chronic ovarian inflammation. There are no symptoms characteristic of tubal displacement.

Diagnosis. Prolapse of the ovary, when freely movable, is readily determined by bimanual palpation. A mass can be felt posterior to the uterus in Douglas' pouch, which varies from the size of an almond to that of a small orange. These masses can be pushed up. As they rise in the pelvis, they fall toward the side corresponding to the affected ovary, and drop backward as soon as the force is removed. When the ovary is enveloped and the pelvis filled with inflammatory exudate it is more difficult to determine its situation and, in fact, it may not be discovered until after the abdominal cavity is opened. Frequently tubal enlargement with adhesions can be recognized as extending around the side of the uterus on its posterior surface, and the organs are more or less fixed.

Treatment. Inflammatory conditions of the tube involving the ovaries should receive—when the tubes alone are affected—the same treatment. Prolapse of the ovary associated with chronic ovaritis, in which the ovaries are very much enlarged, is best treated by extirpation. When the enlargement is simply due to prolapse, causing more or less ovarian edema, the organ should be brought up and fixed in its proper position. Frequently shortening the round ligaments or ventrofixation will bring with it restoration of the position of the ovaries. When these, however, do not rest upon the posterior surface of the broad ligament, but drag backward into Douglas' pouch, the infundibulopelvic ligaments can be shortened, the external end of the ovary stitched to the posterior surface of the broad ligament near its upper part, or as has been suggested, a puncture can be made in the thin tissue between the tube and round ligament and the ovary pushed through and the opening closed so that this organ subsequently rests upon the ligament. Efforts have been made to maintain the ovary in its restored position by mechanical means, but in my experience they are usually ineffective. The ovary slips behind a pessary, though it have a thick bar, becomes pinched, and adds to the patient's distress. Often when the ovary is caught behind the instrument, the patient will be unable to move for a few minutes, owing to the severe pinching of the inflamed organ.

268. Genito-urinary Hemorrhage. The advisability of considering hemorrhage under a separate heading or division may be questioned, when under all circumstances its presence is an indication of the existence of disease rather than the actual palpable disorder. However, my experience has caused me to believe that in the diseases of women the gravity of this symptom is not always appreciated fully, and this failure will be better overcome if the subject is given the importance of a separate consideration.

Site and Varieties. Hemorrhage may arise from any portion of the genito-urinary tract and from the vessels within the adjacent cellular tissue. It can occur at any age, though prior to puberty it takes place but rarely, except from trauma. The significance of hemorrhage is largely dependent upon the age at which it makes its appearance. Hemorrhage is called open when the blood escapes from the urethra, vagina, or through external injuries; concealed, when within the abdominal cavity or in the cellular tissue. In the latter, also, it may be denominated as circumscribed. A discharge of blood mixed with urine is known as *hematuria.* An excess of bloody discharge synchronous with the regular menstrual period is *menorrhagia;* while bleeding of an irregular character is *metrorrhagia.* A collection of blood in the cellular tissue is a *hematoma;* when in the tissues of the vulva or vagina, it is called a *vulvovaginal thrombus* or *hematoma;* into the cellular tissue about the uterus, an *extraperitoneal hematocele;* an accumulation within the peritoneal cavity, which is encysted or closed in by peritoneal adhesions, is described as an *intraperitoneal hematocele.* Hemorrhage into the structure of the ovary, when small, is known as an *ovarian apoplexy;* and when large, or frequently repeated, so the ovarian stroma is practically destroyed, and the collection forms a blood cyst, it is called an *ovarian hematoma.* A collection of blood in one of the hollow organs is known, in the Fallopian tube, as a *hematosalpinx;* in the uterus, as a *hematometra;* and in the vagina, as a *hematocolpos;* or when the collection is so large as to involve all, it is denominated a *hematocolpometrosalpinx.* Further distinctions are retro-uterine, circum-uterine, and ante-uterine hematocele, according to the situation of the blood collection—behind, about, or in front of the uterus.

269. **Hematuria** is blood mixed with the urine, and is engendered by urethral caruncle, polypi, vegetations, fissures (the latter situated about the internal meatus), and malignant disease of the canal. It occurs in acute and chronic cystitis, associated with more or less vesical ulceration, and in the aggravation of the disorder occasioned by the presence of vesical calculi. Malignant growths or villous projections from the vesical mucous membrane are a prolific source for the occurrence of blood in the urine. It is often produced by injury, inflammation, or malignant disease of the ureters or kidneys. Stone in the pelvis of the kidney frequently causes bloody urine. Occasionally blood appears in the urine as a result of constitutional conditions. So frequently is it associated with malarial infection as to give rise to the term malarial hematuria.

Symptoms and Diagnosis. The blood may be mixed with urine, giving it a dark, smoky, often almost black appearance, or may precede or follow the act of micturition, as a few drops of free blood mixed with the urine or in the form of a small clot. The clots may be bright and recent, or darkened by longer retention within the urine. Unmixed blood comes from an injury or disease of the urethra; frequently a few drops or a small clot will follow urination when caused by a fissure of the meatus. When bleeding is occasioned by disease or injury of the bladder, the urine is not constantly bloody. An evacuation may be perfectly clear and the next be bloody.

The cause of the symptom is ascertained by careful examination. Disorders of the urethral orifice are recognized by inspection of the canal, by palpation, and, if necessary, by inspection through an endoscope or a urethral speculum. A fissure at the internal urethral orifice causes severe pain upon palpation of the urethra.

Inflammation of the bladder—cystitis—is recognized by painful and frequent micturition and attacks of profuse bleeding. The microscope reveals the cellular elements of the blood and degenerating epithelium in the urine. Where there are growths or foreign bodies palpation discloses thickened walls, increased tenderness, and possibly the mobility of a foreign body or calculus. Microscopic investigation of the fluid evacuated is of great value. Not infrequently the bladder may be the seat of profuse bleeding, the blood becomes coagulated, and the clots interfere with the collection and evacuation of the urine.

Disease of the ureter and pelvis of the kidney may produce bloody discharge. Irrigation of the bladder permits the character of the urine from the kidney to be determined. Through the speculum the ureteric orifice often will be seen as a pouty, more or less abraded elevation, from which bloody urine is seen to issue. Catheterization of the ureter will determine the character of the secretion in the respective kidneys and the existence of disease in one or both of the organs. Calculi in the renal pelvis are generally a source of pain in the region of the kidney. Generally the pain is felt along the course of the ureter, not infrequently over the distribution of the genitocrural nerve.

Treatment of hemorrhage is the same as that of the condition producing it. Hemorrhage from the bladder and urethra must be recognized as of importance.

When trouble cannot be discovered in the urethra and bladder, the treatment should be directed to the disease in the pelvis of the kidney. Before proceeding to internal measures, constitutional conditions should be excluded. If necessary, the blood should be examined for the presence of the malarial plasmodium. The determination of malaria should indicate the use of antimalarial remedies. Bleeding may be arrested by the employment of astringents—tannic and gallic acids, hydrastis, and hamamelis; cotarnin hydrochlorate, gr. ss—j every three hours; ergotin, gr. j—ij four times daily; ol. erigeron, gtt. v—xx every three hours; gelatin in 10 per cent. jelly by the stomach, or 2 to 3 per cent. solution in salt solution by hypodermoclysis. Tyson advises ferri persulph., gr. 1/4—1/2, as very effective.

Continuation of bleeding associated with renal calculus should indicate operation for its removal. Operation will be a conservative course, for the continuance of the disorder necessarily results in renal degeneration and destruction.

270. **Genital hemorrhage or bleeding** is a term employed to describe bleeding which makes its exit externally, and may arise from any portion of the genital tract. Bleeding of slight character—a few drops—which will occasionally soil the clothing, will be a source of great anxiety to a nervous patient and should be considered an indication for a careful investigation by her physician. Such bleeding may arise from irritation of the vulva, warty growths, scratching induced by pruritus, from caruncle of the urethra, papillary growths and granulations of the vestibule or vaginal mucous membrane, lacerations, abrasions or erosions, or beginning malignant diseases of the vagina or cervix, inflammation of the endometrium, or changes incident to gestation or parturition. More severe bleeding or hemorrhage is induced by injuries of the vulva caused by falling and striking against a sharp object or by kicks or blows; these injuries cause very severe hemorrhage when the bulb of the vestibule is injured. Hemorrhage is also incident to malignant disease of the labia or clitoris, severe injuries of the vagina, or extensive lacerations of the cervix. Interstitial endometritis, fibroid growths encroaching upon the uterine cavity, and epithelioma, carcinoma, and sarcoma of the uterus are frequent causes. Hemorrhage from the genital tract may also result from disease outside of the canal which interferes with its circulation, as, inflammatory exudate, cellulitis compressing the vessels of the pelvis and interfering with the return circulation, displacements, extra-uterine pregnancy, intraligamentary tumors of the ovary or of the uterus, inflammation of the Fallopian tubes, chronic inflammation of the ovaries, and constitutional conditions (as disease of the heart, of the kidneys, or of the liver) which affect the circulation in the uterus. The circulation is very often temporarily influenced by the development of zymotic diseases. Severe uterine hemorrhage may occasionally usher in an attack of typhoid fever. Disturbance of the process of gestation by hemorrhage may indicate the occurrence of abortion or of premature labor, or may follow abortion or labor where the secundines or portions of the placenta are retained.

Diagnosis. The determination of the existence of external hemorrhage, of course, presents no difficulty. It is exceedingly important, however, that we should be able to recognize its etiology and source. This will often be found difficult. No physician does justice to his patient who permits her to bleed without subjecting her to a careful examination in order to ascertain the cause. Not infrequently patients will object to the necessary examination. Such a patient should be given to understand plainly that the physician cannot continue to treat her unless she affords him an opportunity to know the existing conditions. He will do himself less injury by absolutely refusing to treat the case than he will if he yields to the patient's objection and endeavors to palliate an unrecognized disease. Unfortunately, many patients have an idea that hemorrhage at or near the climacteric is a condition to be expected, so if free bleeding occurs at this period, they attribute it to the coming change of life and continue to endure it. Members of the medical profession, I find, are responsible for this misconception, as frequently they advise the patient that the bleeding is incidental to her period of life, therefore, when this has passed over, the hemorrhage will cease. Such a statement, however, only calms the patient and favors a transition from the existing state to another and perhaps more serious one. Moreover, when the discovery of the actual condition is made, the time for radical measures has elapsed. The occurrence of hemorrhage incident to local or constitutional conditions makes it incumbent upon us to examine carefully every organ of the body to be certain of its cause.

In every woman who suffers from hemorrhage, where we are able to eliminate constitutional conditions, and where we can discover no disorders in the tissues about the organ or any disease of the cervix to explain the cause, the uterine cavity should be thoroughly explored. The previous history of the patient will enable us to ascertain whether the bleeding is due to the retention of products of a recent gestation. Bimanual examination will generally reveal even small growths. Such a condition will be manifested by localized areas of enlargement or resistance in the organ. Some of these growths, being pedunculated, can be moved about in the uterine cavity to a limited degree. Combined palpation also affords information as to the possibility of malignant disease. The latter occurs more frequently in the cervix, and when it exists in the body, it causes more or less hardening and sense of resistance from the presence of infiltration. This, of course, depends somewhat upon the associated reactionary inflammation. If the disease involves only a portion of the lining membrane of the uterus without the infiltration extending into the wall, the bimanual examination will not reveal the induration. Therefore it will be necessary to explore the uterine cavity, preferably with the finger. The finger within the uterus and the hand over the abdomen enables one to outline and determine definitely the thickness and rigidity of the wall and the extent of induration as well as the general condition of the uterine mucous membrane. In the non-puerperal uterus, however, one cannot readily employ digital exploration of its cavity without a previous dilatation.

Dilatation may be accomplished by a variety of methods, one of which is the employment of mechanical dilators or of graduated bougies. This procedure affords an excellent opportunity for the employment of therapeutic measures within the uterus, but sufficient dilatation of the organ cannot be secured thus to allow the introduction of the finger without tearing and inflicting serious injury to the cervix. The cervix may be incised on either side within at the internal os with scissors or knife, after which the canal can be dilated or stretched enough to permit the introduction of the finger. Often this method of procedure is associated with an extensive laceration of the uterine structure into the parametrium. Furthermore, incision of the cervix is too radical an operation for mere exploration. It is only when it is necessary to institute treatment for a threatening condition within the uterine cavity that we would advise cervical incision, which should be through the vaginal portion. Another method of dilatation is that devised by Vulliet, which consists in packing the uterine cavity with pieces of gauze until the cervix becomes gradually dilated, and renewing this gauze packing until the uterine cavity is so well dilated that the finger can be introduced readily. This plan is open to the objections, however, that the gauze is an irritant, requires care that the patient does not become infected during the procedure, and in many cases, particularly when the cervix is the seat of inflammation and is a little rigid, the dilatation is ineffectually accomplished.

The most effective method of dilating the cervix is accomplished by tents. These may consist of sponge, laminaria, or tupelo. Sponge tents are objectionable on account of the difficulty of rendering them sterile and because of the fact that they readily become impregnated with the discharges, which quickly decompose and predispose to infection. This danger has in some degree been obviated by the suggestion that the tent be covered with a rubber sleeve, but this requires the employment of special measures to convey the moisture to the tent. The laminaria tents are exceedingly effective, preferably the perforated ones. The tent should be carried into the uterine cavity without much force, the tent and the canal having been previously rendered, as near sterile as possible. As large a tent as can be introduced should be used. When the cavity is somewhat dilated or when the first tent is not sufficiently large, and more complete dilatation is desired, a number of tents or a nest can be used. More rapid dilatation is accomplished by moderately stretching the canal with bougies previously. If aseptic precautions are observed, the danger is not increased thereby. The details of the procedure and the precautions to be exercised have been given. (Sec. 56.)

Treatment should be directed to the disorder which has caused the hemorrhage. It may not be convenient nor desirable to subject the patient to radical treatment, while the hemorrhage may be so severe as to necessitate the exercise of measures to save her life. For relief of hemorrhage various agents are advocated which exercise contractile power upon the involuntary uterine mucous membrane. Ergot is one of the most efficient. It not only causes contraction of the uterine muscle wall, but also decreases the amount of blood that is sent into the uterus through the contraction of the uterine vessels. Thyroid extract and the extract of mammary gland have been highly extolled. The various astringents are of benefit, as gallic and tannic acids; dilute sulphuric acid; iron salts, especially the persulphate of iron; hamamelis; hydrastis and its salts, hydrastin and hydrastinin; and the tincture of cinnamon. The latter may be given with good effect in combination with either gallic or tannic acid, giving from ten to thirty grains of the acid with a tablespoonful of the liquid. Cotarnin hydrochlorate (stypticin), gr. ss—j every two or three hours, is frequently very effective in controlling hemorrhage. The administration of glonoin or the nitrate salts to decrease vascular tension are worthy of consideration. Perchloride of iron solution may be applied to the uterine cavity by injecting a few drops, or swabbing the cavity with it.

The patient should be kept perfectly quiet in bed; if hemorrhage is severe, she should be prevented from rising even to evacuate the bowels or to void the urine. Cold applications may be made to the abdomen, and heat or a mustard-plaster applied between the shoulders, in order to divert the current of blood from the pelvis. Local applications of various astringents, such as alum, zinc sulphate, hydrastis, or hamamelis, used in strong solution or as a douche, may be used. Douches of hot water should be given the patient while in the recumbent position, using water at from 110° to 115° F., even 120° F. if the patient can bear it. The objection to the injection is that the uterine cavity will contract upon its contents, causing contraction of the cervix, by which the contents may be forced from the uterine cavity into the tubes, and produce inflammation within them, or, worse, a localized peritonitis. Gersterberg uses a strong solution of formol upon a cotton-wrapped applicator. A solution of aluminium acetate has been advocated. When hemorrhage is severe, endangering the patient by its continuance, the uterine cavity should be tamponed, by packing a good-sized piece of gauze firmly into the cervix. The further discharge of blood is prevented and dilatation of the canal facilitated when it can be explored with the finger. These measures for the treatment of hemorrhage are merely palliative. They do not correct the fault nor the trouble which induced it; and the earlier radical treatment can be instituted, the better it is for the patient and the more readily is the condition controlled. Slight bleeding from the vulva and vagina is readily controlled by making applications of an astringent or a styptic, such as persulphate of iron directly to the diseased surface. The cavity should be packed, in order to secure further improvement through pressure. When bleeding occurs from an injury to the vulva, the most efficient method is to enlarge the external injury and secure the bleeding vessel by ligation. When a large surface bleeds, the hemorrhage is best controlled by packing with iodoform gauze, making firm pressure upon or into the wound. When the bleeding is the result of incomplete abortion or the existence of an intra-uterine growth, the offending cause should be removed. An interstitial endometritis should indicate the employment of the curet. Atmocausis, or the application of steam to the uterine cavity by a special apparatus, has had many advocates, but it would seem desirable to employ more controllable measures, as it is impossible to regulate accurately the amount of destruction to which the uterine mucosa will be subjected, and to equalize its distribution definitely.

271. **Vulvar hematoma, hematocele or thrombus** are terms applied to hemorrhage which takes place in the tissues of the vulva. It arises as a result of injury sufficient to cause rupture of a vessel without a break in the integument. When the injury involves the bulb of the vestibule, hemorrhage may be extensive and cause a large-sized tumor, which involves one or the other large labium. Hemorrhage also occurs from rupture of varicose veins or from compression of vessels during the progress of labor. The latter is the most frequent cause. The tumor may attain the size of an orange or even of the fist, and may be very tense and painful. It usually occurs suddenly, and is associated with

more or less burning and pain in the region of the swelling while it develops. When the skin is unbroken and the collection does not become infected, it may be completely absorbed.

272. **Vaginal hematoma or thrombus** uncomplicated is of rare occurrence. It is usually associated with hemorrhage into the vulvar tissue, forming a vulvovaginal thrombus. Generally it occurs upon one side of the vagina, and most frequently is a result of injuries sustained during labor. The exciting agent is the passage of the presenting part of the child, which frequently pulls off and stretches the vaginal attachments. This causes rupture of the vessels and severe bleeding. The tumor may attain a very large size, compress the vagina and rectum, and cause difficulty in micturition. The physician may be in doubt, when called to see such a patient, whether it is an accumulation of blood or a suppurative process. The better plan of procedure is, of course, to make a careful examination. With the history of the patient in mind, we may be able to eliminate the probability of inflammation, especially shortly after a confinement. During the year 1898, three weeks after her first confinement, I saw a patient, thirty-four years of age, who had passed through a normal labor. She had, however, sustained a slight laceration of the perineum, which was repaired. Two weeks subsequent to her delivery she developed some elevation of temperature, with more or less distress in the pelvis. Examination disclosed a large swelling which compressed the vagina and rectum. The mass thus formed was quite large and protruded into the vagina to such a degree as to obstruct it greatly, as well as to encroach upon the rectum. Sensation of fluctuation was indistinct. The right buttock was edematous and so much more prominent than the left and the sensation of elasticity, almost fluctuation, so marked that I decided to incise through it and thus reach the mass, rather than to make an incision from the vagina. The incision into the buttock, however, disclosed that the swelling in it was entirely edematous. Through this incision the levator ani muscle was opened, when there was at once a discharge of a large quantity of bloody fluid and clots. By pressure through the vagina the mass was readily removed, and the patient looked and expressed herself as feeling greatly improved. A gauze wick was passed through the wound into this cavity with a view to insure drainage and to prevent its premature closing. The gauze was removed at the end of twenty-four hours, and the subsequent progress of the patient was uninterrupted. I saw another case of this kind in a young woman who had been delivered by forceps. The right side of the pelvis was apparently occupied by a large clot, which bulged into the vagina, protruded into the labium, and gave rise to suggillation of the entire buttock. This mass was incised from the vagina and was found to extend into the broad ligament of the right side. The clot was thoroughly turned out and the cavity packed with a large quantity of iodoform gauze. The patient recovered. I have observed one case of vaginal hematocele in which labor was complicated by an ovarian dermoid. The union of this growth with the uterus had been destroyed by previous torsion. The tumor subsequently became engrafted by a broad band of adhesion

upon the omentum, from which it evidently received its nutrition. The tumor was attached below by folds of the peritoneum, which extended over and to the left of the bladder. In the fold, dipping down into the pelvis in front of the bladder and to the left of the vagina was an extensive collection of clotted blood, which had evidently been produced by pressure upon the inferior attachments of the tumor during the progress of labor.

Diagnosis. Vulvar hematoma is apt to be confounded with edema of the labium and with labial tumors. Its development, however, is too sudden for the latter condition. Edema of the labium generally is associated with other disorders. It is not one-sided. Both labia are involved unless the edema is due to some special cause in which there is obstruction of vessels or lymphatics on one side only. Vulvar and vaginal thrombi are usually associated, producing the condition already described as vulvovaginal thrombus. The condition generally follows difficult or complicated labors. Pus-collections are rarely found in the lateral walls of the vagina, but are most frequently pushed into the vagina from the posterior fornix. Thrombi, on the other hand, are frequently found upon the lateral surface and rarely affect the posterior vaginal wall.

Treatment. The amount of bleeding in these thrombi is usually limited, for the pressure of the tissues into which bleeding occurs naturally controls it. In non-infected cases the extravasated mass ultimately is absorbed, although in large collections it may remain for quite a long time. A patient came under my observation for pelvic inflammation. Examination disclosed posterior to the rectum, in the neighborhood of the sacrococcygeal articulation, a mass which had an elastic sensation. Upon inquiry, I found her first labor had occurred six months before, with a history of an injury to the coccyx. The coccygeal injury had, however, disappeared; the mass remained. As I had already made an incision through the vagina into the peritoneal cavity, I did not care to attempt to open into this from the vagina, on account of the dissection required around the rectum. An incision was made into the sac posterior to the anus, when a teacupful of thick, pasty, reddish material, evidently the remnants of a clot, was evacuated. Gauze drainage was instituted, and the cavity gradually closed. When the collection is small, it may, without detriment to the patient, be left to nature; but when large, the pressure produces thinning of the enveloping wall and permits the ready introduction of infecting germs, either from the rectum or vagina. In such collections the danger of subsequent infection is decreased by free incision and the evacuation of the accumulation. Not only should the clots be removed, but measures must be employed to preclude further hemorrhage. A large bleeding vessel may be secured by passing a ligature beneath or about it with a needle. When ligation is impracticable hemorrhage should be controlled by packing with iodoform gauze. The gauze should be retained for two or three days, and should be renewed with a smaller amount, in order to keep the external wound open long enough for the cavity to undergo thorough contraction.

273. **Peri-uterine hemorrhage** may be intraperitoneal or extra-

peritoneal. Intraperitoneal hemorrhage, unless preceded by inflammatory adhesions which form limitations, is free, and may be large in quantity. Extraperitoneal hemorrhage takes place into the cellular tissue about the uterus and the broad ligaments, and is limited by the pressure of the tissue. Hemorrhage into the cellular tissue beneath the peritoneum undergoes coagulation and forms a bloody tumor, known as a hematocele. It is analogous to the thrombus which occurs during the progress of labor, and which we have described under the term vulvovaginal.

Hemorrhage into the peritoneal cavity will form a coagulum, and subsequently a tumor; or, when very free, may remain liquid and the hemorrhage continue until the death of the patient or until surgical intervention is practised.

The causes may be divided into two classes: 1. Hemorrhage that results from extra-uterine pregnancy, which is more important, because more frequent and more serious in its results; 2. Hemorrhage of nonpuerperal origin, which occurs without the existence of fecundation. The pelvis being the most dependent portion of the abdomen, hemorrhage from any of the intra-abdominal viscera, or within any portion of the peritoneal cavity, naturally gravitates into the pelvis. Thus, we may have intra-abdominal hemorrhage from traumatic injuries of the liver or spleen, rupture of an aneurysm of the aorta or of the celiac axis, rupture of varicose veins, from the ovary, regurgitation from the Fallopian tube of menstrual blood (particularly when there is obstruction of the uterine neck), rupture of a uterine or tubal collection, rupture of bands of adhesion in the pelvic peritoneum, slipping of a ligature, or the retraction of a cut vessel following an operation. Any of these causes may lead to an accumulation of blood in the pelvis—particularly in Douglas' pouch—whereby the intestines containing gas are floated up and the uterus is pushed forward. Sooner or later the coagulated blood causes irritation and leads to the formation of adhesions, by which the collection may become encysted and form what is known as an intraperitoneal hematocele. (Fig. 448.) The most frequent cause, however, belongs to the division of the puerperal or extra-uterine.

Symptoms. Intra-abdominal hemorrhage from whatever site or cause, unless limited by previous adhesions, will gravitate into the pelvis. The gravity of the symptoms will depend upon the size of the vessels injured and the rapidity of the hemorrhage. Generally the rupture of the vessel is associated with pain in the vicinity of the lesion. This sensation may be intense cutting or burning. If the hemorrhage is slight, it may be slow and produce little constitutional evidence if any. When severe, the symptoms of shock are profound and may be announced by agonizing pain, accompanied by syncope or repeated attacks of fainting. The skin is pale, covered with a cold, clammy perspiration, the pupils are widely dilated, pulse feeble, frequent, or absent in the radius. The mere effort to raise the head may lead to unconsciousness. The temperature is subnormal. The syncope may be associated with such reduced arterial tension that a clot is formed, which obstructs the bleeding vessel and becomes so firmly fixed that as the patient reacts the hemorrhage is controlled. The salts of the blood so irritate the peritoneum that a mild grade of peritonitis results, which leads to the collection becoming encysted. The watery portions of the blood are absorbed and the clot may gradually become organized and result in thickening of the peritoneum and adhesions as the only traces of its occurrence. More frequently the condition from which it has originated, or the stagnation from the imprisoned intestinal coils, or previously existing tubal disease, leads to infection and the formation of a pelvic abscess. Unless such a condition is promptly evacuated, general infection may follow.

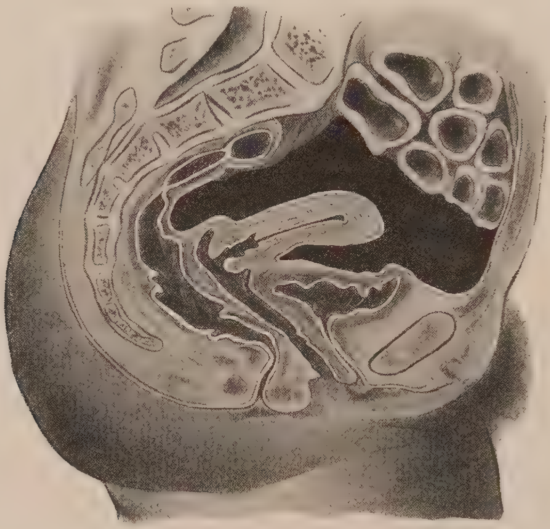


FIG. 448.—Intraperitoneal Hemorrhage.

274. **Extraperitoneal hematocele** may be produced by puerperal or nonpuerperal causes. (Fig. 449.) It is more frequently associated with ectopic gestation. The nonpuerperal causes are the rupture into the broad ligament of varicose veins, and injury of an artery or its retraction from the stump when the pedicle is ligated *en masse*.

Symptoms. Extraperitoneal hematocele in the broad ligament is limited in its character, and causes symptoms similar to those which have already been enumerated for the intraperitoneal variety, though in a much slighter degree. The indications of shock and collapse are much less marked, and hemorrhage, from its limitation, is much less serious in its influence. As it occupies the broad ligament, it is usually situated upon one side of the pelvis, and pushes the uterus to the opposite side. This hemorrhage may be situated either in the upper part or in the base of the broad ligament, and may produce different physical signs according to its situation. The hemorrhage, when low in the broad ligament, may dissect forward between the uterus and bladder, or backward around the uterus beneath the peritoneum, and extend to the opposite side. In the great majority of cases, however, extraperitoneal hemorrhage is one-sided.

Diagnosis. Peri-uterine hemorrhage, whether intraperitoneal or extraperitoneal, is determined by the phenomena of internal hemorrhage. It is true that similar symptoms—a sharp pain, symptoms of collapse—might arise from rupture of a pyosalpinx or a pelvic abscess. In such accidents, however, acute agonizing pain is caused, with symptoms of peritoneal reaction which are more intense, but a tumor does not form. A retroflexed gravid uterus may be mistaken for hematocele, but the outline of the boundaries of the organ are more definite. In hematocele the uterus is frequently inclosed within a mass or pushed forward, while by a careful examination in a retroflexed gravid uterus the cervix is found at a higher level, either in the axis of the vagina or looking forward. A distinct angle exists between it and the smooth, definitely outlined mass filling up the pelvis, which should not be confounded with hematocele. Ovarian cysts and uterine fibroids imprisoned within the pelvis possess nothing in common with hematocele. The manner of appearance and the course of development of the condition are entirely different. Extra-uterine pregnancy before rupture does not present similar symptoms, although it may be a starting-point for the later hemorrhage, and unless the examination is carefully performed, rupture may result from the methods used for diagnosis. Extraperitoneal is determined from intraperitoneal hemorrhage by the situation of the collection upon one side, which is more definitely localized, its boundaries more sharply defined, and the uterus generally pushed to the opposite side, while in the

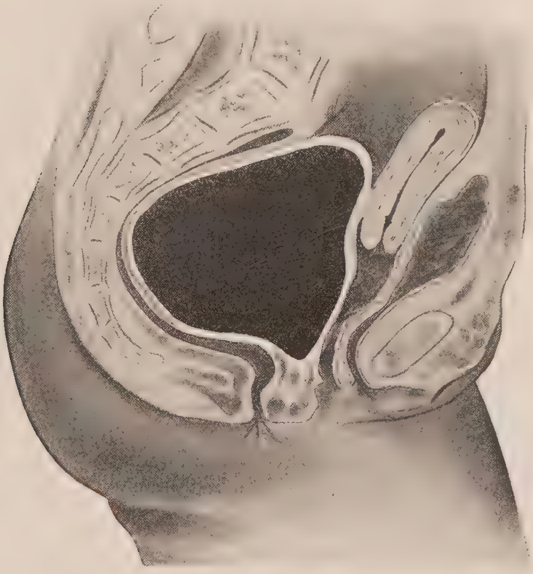


FIG. 449.—Extraperitoneal Hematoma.

intraperitoneal hematocele the latter is surrounded by the accumulation or is pushed forward. It is not always easy to determine the cause of the hemorrhage. Previous symptoms of pregnancy, amenorrhea, with symptoms rapidly ushered in, profound depression, and very marked anemia, should lead to the suspicion of probable rupture of a fetal sac. Symptoms of collapse or depression, or internal hemorrhage, may arise from rupture of internal varicose veins. In hemorrhagic salpingitis the condition is more insidious, the progress more slight, owing to the gradual effusion of blood. Should there be any doubt of intraperitoneal hemorrhage, the true condition can be surely determined by making an exploratory puncture through the posterior vaginal fornix. This is a justifiable and commendable procedure.

Prognosis. The affection is always a serious one. We cannot be certain that death may not result suddenly from a continuation of the hemorrhage, or, when hemorrhage has apparently been arrested, that the clot may not be loosened and hemorrhage again recur. In large collections the progress of the case is exceedingly tedious. Plastic material remains about the uterus for a long time, becomes more or less organized, frequently is a source of discomfort, and often a cause of sterility. That sterility is not invariably caused is evident from the numerous cases recorded of women who have suffered from hematocele where the collection is ultimately absorbed, the patient has an ectopic gestation later. The presence of a large collection of blood within the pelvis is a source of continuous danger from its close proximity to the vagina and rectum, through either of which channels infectious material may enter and cause pelvic suppuration. Suppuration is particularly apt to occur if the individual has had previous tubal disease. Doubtless, the infection develops from this.

The extraperitoneal variety is less serious in its influence, more likely to undergo absorption, and leaves less evidence of its previous existence. Its situation renders it less susceptible to infective changes. When the collection is large, however, and has existed for some time, the patient will, without question, have a more favorable prognosis by the exercise of measures for its removal.

Treatment. Active interference must depend very much upon the character of the symptoms and the severity of the attack. When the symptoms are such as to indicate escape of a large quantity of blood into the pelvis, the abdomen should be opened promptly, clots removed, and the bleeding vessel secured. In profuse internal hemorrhage ligation of the bleeding vessel is just as certainly indicated as in hemorrhage from the radial or femoral artery. When hemorrhage has apparently been arrested and a reactive peritonitis develops, we are not absolutely certain that the clot cannot be displaced and the patient suffer from a recurrence of hemorrhage, which may be fatal; or that the collection of fluid about which nature is forming its barriers may not become infected from the neighboring hollow viscera and cause subsequent changes, necessitating its evacuation, with increased danger to the patient.

In extraperitoneal hemorrhage the indications for operation are not so marked. The symptoms are much slighter, the amount of exudation is less, and the probabilities of infection are diminished. In such cases we can afford to wait and trust to nature to absorb the effused fluid. In large collections, however, much time will be saved by evacuation. The method of operative procedure will depend upon the time the patient comes under observation. In an acute attack, with an evidently bleeding vessel, we should follow the procedure which affords the most accurate and complete exposure, with ready access to the field of hemorrhage. Abdominal incision meets every indication, as through it we are enabled to see and to reach the bleeding vessel. If the patient comes under observation a week or more subsequent to the hemorrhage, when the peritoneal reactive processes have encysted the collection, and vaginal and abdominal palpation discloses that barriers have been formed by plastic exudate between the knuckles of intestine over the surface of the hematocele, the vaginal incision is preferable. This procedure respects the barriers which nature has constructed to limit the collection, and affords free opportunity for the evacuation of clots. They are removed by the finger and by irrigation. With gauze packing and a free vaginal incision the subsequent progress of the case is much less severe and the length of the convalescence decreased. When blood has been effused into the peritoneal cavity and clots have formed, by neither the abdominal nor the vaginal method would we be able to remove all the clotted blood. The clotted material remains adherent to the sides of the sac and pelvis, and is likely in either procedure to cause a certain elevation of temperature as a result of the fermentation taking place in the retained fibrin. When the condition has gone on to suppuration and is accessible, the vaginal route is beyond question the preferable procedure for reaching the collection. I would not be understood as teaching that all cases of internal hemorrhage are necessarily fatal or require operative interference. If the patient is unwilling to undergo operation, or the conditions do not urgently demand it, the promotion of absorption should be accomplished by keeping her absolutely at rest in bed, by the use of the catheter to empty the bladder, and by the evacuation of the bowels or intestines by enemas. Absolutely interdict the use of opium, keep the vagina antiseptic by repeated douches, and when it is supposed that hemorrhage still continues, or is in danger of being renewed, apply an ice-bag over the abdomen, introduce ice suppositories into the rectum, and thus bring the cold in close contact with the bleeding vessels. In extraperitoneal hemorrhage indications for operation are much less marked. The absorption may be promoted by keeping the bowels regular and the patient at rest, and by the application of cold or of counterirritants over the abdomen. When operative interference seems indicated, the preferable procedure is to make an incision through the vagina into the broad ligament, tear with the finger or a blunt instrument through the tissue of the ligament until the hematocele is reached, then enlarge the opening, turn out the clots, irrigate the cavity, and introduce gauze to afford vent for further discharge. When the collection is very large, it may sometimes be evacuated by an incision above Poupart's ligament. Pushing back the peritoneum, the collection is exposed, opened and evacuated. After the cavity is thoroughly emptied, it should be packed with gauze, as already advised.

ECTOPIC GESTATION.

275. **Ectopic Gestation.** When the fecundated ovum does not reach its normal situation—the uterine cavity—but undergoes development external to it, the condition is known as ectopic gestation or extra-uterine pregnancy. The former term is the better as it signifies misplaced. While the ovum may develop in the uterine wall and present the most dangerous form of misplaced pregnancy, it still is not properly described as extra-uterine.

Much difference of opinion exists as to the point at which the union of the spermatozöon and the ovum, and its consequent fecundation, take place. Tait very firmly asserted that in the normal condition this fecundation always occurred in the uterus. Others as emphatically believe that fecundation may occur at any point between the internal os and the exit of the ovum from the Graafian follicle. The recognition of the fact that in the lower animals the spermatozoa in normal conditions are found in contact with the ovary would seem to afford justification for the belief that fecundation does not absolutely occur within the uterine cavity. Fecundation in the majority of cases undoubtedly occurs in the tube, but may take place at any point in the progress of the ovum to the uterus. The changes which follow, as a result of fecundation, produce alterations in the uterine mucosa which prepare it for the reception of the fecundated ovum.

Causes. Much difference of opinion still exists as to the causes which lead to the occurrence of a misplaced gestation. Some would deny that inflammation has any part in its production, and would lead us to believe that the existence of inflammation in the tube always produces alterations which preclude the subsequent occurrence of pregnancy. Every abdominal surgeon of any experience, however, has seen cases in which well-marked tubal disease, and frequently of evident gonorrheal origin, has subsequently recovered, and the patients have given birth to children. During the active inflammation of such tubes the abdominal orifices are closed off by exudate, which subsequent to resolution, may be reabsorbed and afford an unobstructed entrance to the tube. Those who exclude inflammatory conditions as a cause attribute the occurrence of ectopic gestation to congenital conditions, consisting of long tortuous tubes containing numerous tubal constrictions, especially, or, a tubal diverticulum. It is also attributed to intratubular growths, which limit the caliber of the canal, or to growths in the tubal wall, or to pressure of growths external to the tube. The hypothesis of the migration of the ovum from the ovary of one side to the tube of the opposite side has been well established. As evidence, a history is recorded in which an intra-uterine pregnancy occurred in a woman who had lost the tube of one side and the ovary of the opposite side. It has been supposed that the ovum, having become fecundated upon its emergence from the Graafian follicle, attains too great a size before it reaches the tube of the opposite side to permit of its passage down that canal. The vegetations upon the ovum, however, which form the chorion, do not develop until the ovum has come in contact with the tubal mucous membrane, hence this cause is of doubtful application. Every one familiar with poultry is aware that occasionally an unusually large egg will be laid. Indeed, I have seen cases in which the egg was too large to pass through the canal. It is not improbable that similar conditions exist in the formation of the ovum, and that, occasionally, an oversized fecundated ovum may lodge on its way to the uterus. Fright and emotional conditions at the time of conception are ascribed as causes. Were the latter, however, an important factor, tubal gestation would be likely to occur much more frequently in illegitimate cases.

The study of the history of ectopic gestation long ago led to the recognition that a misplaced gestation was frequently associated with prolonged sterility. It is not unreasonable to believe that a period of sterility has been one in which inflammatory conditions existed which have subsequently improved. Investigations of inflammatory conditions disclose the fact that loss of the tubal epithelium is of rare occurrence. The existence of the gestation is due, not so much to the presence of patches of desquamated epithelium, as to inflammatory changes which cause the canal to become narrowed, and the folds of the mucous membrane thickened, thus rendering the passage of the fecundated ovum more tedious than under normal conditions. The expedition of the ovum to the uterus is also retarded by the decreased peristalsis resulting from hyperplasia and loss of activity in the muscular wall. Gonorrheal inflammation seems to have a special influence in the production of ectopic gestation. Thus, Prochownik found gonorrhea in three out of eight cases, and Ahlfeld, in the few cases he has observed, also attributes the condition to gonorrheal infection. Ectopic gestation may occur at any period of the reproductive life, whether in a first pregnancy or in women who have borne a number of children. Analysis of a large number of cases will show that several years of previous sterility will occur in the majority of cases. It may occur in the first pregnancy of a woman who has been married eight, ten, or twenty years, in a woman who has not given birth to a child for five or six years; or, again, it may follow immediately after a labor or abortion. Furthermore, it may occur in the bride. Both tubes may be pregnant concurrently, one tube may contain a tubal pregnancy, or a tubal may complicate a uterine pregnancy. Cases have been reported in which there occurred a twin pregnancy in the outer portion of the tube, and an interstitial or single pregnancy in the uterine end, making three embryos in the one tube. Dr. Wilmer Krusen has reported a tubal pregnancy which had ruptured, and in the sac three fetuses were found.

Varieties. Ectopic gestation is most frequently of the tubal variety. Some undisputed cases of ovarian pregnancy have been described, but when we consider the fecundated ovum and the conditions necessary for its nutrition and development, it is evident that the ovum rarely develops when not in contact with the Müllerian mucous membrane. It is quite probable that many of the cases described as ovarian pregnancy have been originally tubo-ovarian and have become separated from their tubal relation. Tubal gestation occurs most frequently in the central portion of the tube. (Fig. 450.) It may be situated toward its abdominal end, and as it develops, is extruded or partly extruded and comes in contact with the ovary, when it is known as tubo-ovarian pregnancy. (Fig. 451.) When situated within the central portion of the tube or ampulla, it is ampullar or tubal pregnancy. Toward the uterine end, or that portion which passes through the uterine wall, it is tubo-uterine or interstitial pregnancy. (Fig. 452.) Rupture of a tube with

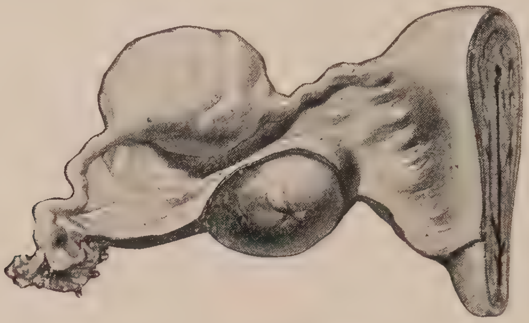


FIG. 450.—Tubal Pregnancy.

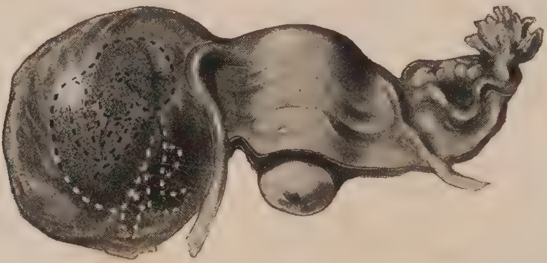


FIG. 451.—Tubo-ovarian Pregnancy.

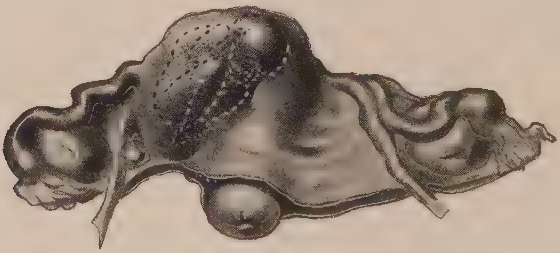


FIG. 452.—Tubo-uterine or Interstitial Pregnancy.

partial escape of the ovum, which retains its placental attachment, may subsequently develop, when it becomes an abdominal pregnancy. Abdominal pregnancy generally is secondary and primary only in extremely rare instances. Dr. B. C. Hirst reports a case which seemed to be a primary abdominal pregnancy. The reimplantation of the ovum upon the peritoneal surface and its subsequent development have been asserted to be an impossibility, but when we find the tube having no longer any relation or connection with the sac, the placenta situated, as in the case of Tuholske, upon the liver, and apparently upon the folds above it, it seems impossible to explain its occurrence upon any other ground than that of reimplantation.

Course and Progress. The fecundated ovum lodged in the tube finds a condition different from that of the ovum within the uterine cavity. In the latter, the mucous membrane consists of glandular or lymphoid tissue, which becomes thickened as a preparation for the reception of the fecundated ovum, in which the trophoblast cells of the ovum enable it to sink in and become embedded. The syncytial cells in the chorion arise from the trophoblast cells, and the uterine epithelium in no sense plays any part in their production. In the tube it meets with an entirely different condition. There are no glands, and there is much difference of opinion as to the formation of the decidua. This, in the uterus, consists of a compact and spongy layer, but in the tube, of a compact layer only. The decidua cells are found not so much in immediate contact with the wall of the tube as at either end of the sac. Bandler, in his investigations on the development of ectopic gestation, divides it into three types: 1, the columnar type of tubal gestation; 2, the intercolumnar; and 3, the centrifugal.

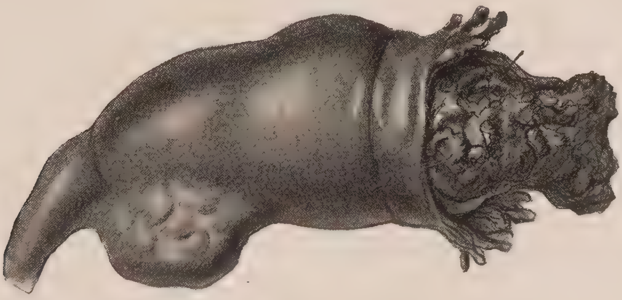


FIG. 453.—Tubal Abortion.

1. In the columnar variety, at no point in the tube wall or in the mucosa is there any decidual change or any condition representing the trophoblast cells or villi, consequently no decidua nor trophospongia develops. The ovum is surrounded by mucous folds and only an invasion of the tubal capillaries follows. Abortion in these cases is easy and causes but little danger; bleeding occurs; the fetus dies, and further hemorrhage expels it. The tube may subsequently become normal or a hematosalpinx may follow. (Fig. 453.) 2. In the intercolumnar type

one-half of the tube is normal, the other torn and infiltrated. The mucous folds are involved down to the muscularis. The ovum is situated upon the tube wall, where it compresses and destroys the folds at the situation known as the serotina. These folds are united at either side about the ovum, forming a pseudoreflexa. Some distance on either side of the serotina, tissue resembling decidua, with closely grouped cells without capillaries or spaces, rests upon and invades the free surfaces. The invasion traverses the mucosa in irregular branches or projections about the blood-vessels, invading and infiltrating their muscular walls up to and into the lumen. Trophoblast cells are accompanied by syncytium, but at no point do the connective tissue cells, the tubal folds, or the delicate submucosa, if present, exhibit any evidence of change which resembles in the slightest degree those occurring in the uterine mucosa, from which any decidual cells develop. Neither is there at any point any change of a so-called syncytial character. The ovum rests upon the wall, and the tubal fold immediately beneath it will be compressed, but the epithelium may remain in the depressions. Other folds may form a capsularis, which consists of mucosa alone. An intervillous space may develop when the capsularis is formed. The villi at the placental site enter the wall and the hemorrhage follows, especially upon the invasion of vessels of the capsularis by fetal cells. The pregnancy may terminate in abortion, complete or incomplete, the latter being the rule usually. If the abdominal end is closed, a hematosalpinx or tubal mole may follow.

3. In the syncytial type the tissue of the tube is invaded by villi cell groups—syncytial cells. Here again there is no evidence of a decidua or of any decidual reaction. When uninterrupted, the capsularis unites with the mucosa of the enveloping tube wall in the same way that this process is exemplified in the uterus. The centrifugal ovum sinks into the wall of the tube, when invasion of the wall and vessels by the villi occurs. Rupture may take place at the summit or hemorrhage from invasion of the vessels entering the intervillous spaces. Bleeding from the villi penetrates the serosa and rupture at the placental site may follow, or, we may have multiple perforations and erosions. The ovum apparently eats up the tube wall and its destruction is not the result of pressure. In such cases the perforations may be so minute as to be revealed only by a microscope. The death of the ovum may not arrest the growth of the villi. This form furnishes the majority of cases of rupture. Very frequently the hemorrhage is due not to rupture but to the erosions from the perforating villi. The presence within the tube of the developing ovum causes the entire structure to become turgid and vascular. There is some tendency in the tube to the development and extension of its structure, but to a much less degree than in the uterus. The wall becomes stretched and attenuated, and thin. The mucous membrane is stretched and its folds effaced. As the tubes vary in length and thickness, the rapidity of thinning differs correspondingly. When the ovum is situated in the outer third, changes follow in the ostium. In the first four cases the fimbria are swollen, turgid, and the congestion extends to the adjacent

muscular and serous tissue; the fimbria are gradually retracted, while the peritoneal margin of the ostium forms an irregular ring, which in four and one-half weeks projects beyond the ends of the fimbria. It finally contracts, and at the end of the eighth week is completely contracted and hermetically sealed. The occlusion, however, is not constant. Occasionally the ostium dilates. The nearer the ovum is situated to the abdominal end, the less likely is it to close. As the tube distends, its vessels rupture and hemorrhage takes place, which fills up the sac and may cause the extrusion of the ovum. The more firmly the tubal end becomes occluded, the greater the danger of tubal rupture. Its situation near the abdominal ostium favors its extrusion through the opening into the abdomen as a tubal abortion. Moles occur in tubal as in uterine gestation; indeed, they are more frequent in the former. They vary from one to eight centimeters in diameter and are globular or ovoid, assuming the latter shape in the larger varieties. The tubal moles are formed by hemorrhage, which occurs in the subchorionic diameter, between the chorion and the amnion. This hemorrhage may be gradual or sudden and results in the death of the embryo—often in its disappearance. Its origin in a misplaced pregnancy in the absence of any vestige of the fetus is recognized by the discovery, through the microscope, of the chorionic villi. The outer investing membrane, the chorion, is generally shaggy, with villi, which are rendered more visible by washing the clot under a gentle stream of water. When the amniotic cavity is obliterated, doubt may exist as to the character of the mass, but section will disclose the villi in clusters as small circular bodies.

Tubal abortion has been mentioned as one of the terminations of tubal gestation, when the developing embryo occupies the external third of the tube. The nearer the fecundated ovum is situated to the ostium, the greater the danger of its extrusion. As the embryonal sac increases to a size beyond that which the tube is able to accommodate, it is pushed out through the funnel shaped cavity and escapes into the abdomen. This accident is denominated tubal abortion, and frequently is associated with profuse hemorrhage, similar to that which occurs in uterine abortion. The mole is discharged with copious hemorrhage into the peritoneal cavity. This displacement is likely to take place during the first two months of the pregnancy. When the ostium is closed, blood escapes from the tube only after rupture of the sac. The quantity of blood discharged sometimes is enormous and attended with all the symptoms of internal hemorrhage. This condition is one of the most frequent causes of pelvic hematocele. Internal hemorrhage in such cases had been ascribed to metrorrhagia, to reflex menstrual discharge from the uterus, or to hemorrhage from the Fallopian tube. The reason why it has been associated with metrorrhagia is that while the embryo is developing in the tube, a decidua is forming in the uterus. With a tubal abortion, hemorrhage occurs from the uterus as a result of the separation and the expulsion of this decidua. As this frequently happens near the time when the patient expects to menstruate, it consequently is regarded as a reflux menstrual fluid. Frequently the bloody discharge from the uterus may be derived from a gravid tube in protracted tubal abortion. If the bleeding occurs at a time not synchronous with the menstrual flow, it often is attributed to a disorder of the uterus. In all such cases the affected tube and the bloody discharge should be examined carefully for the presence of the embryo in the chorionic villi. The abortion may be complete or incomplete—complete when the embryo and its envelope are discharged; incomplete when a portion remains attached to the tube. The latter is more common. The danger is increased in these cases owing to the fact that the bleeding is apt to recur while the mole is retained. The villi will be disclosed by a careful microscopic examination of the extruded mass. They are discovered in sections of the adherent pole of the mass.

The most frequent termination of tubal gestation is that of rupture. As the embryo develops, the tube becomes more and more thinned, until it is no longer able to resist the inward pressure, and rupture results. Rupture of the gestation sac may be considered under: 1. Primary rupture; 2. Secondary rupture—each of which may be intraperitoneal or extraperitoneal.

1. Primary rupture may take place at any time between the third and tenth weeks after impregnation. It rarely is deferred beyond the twelfth. Predisposing causes of rupture are the gradual thinning of the gestation sac by the growth of the ovum or the undue distention of the membrane by hemorrhage, especially at the seat of implantation of the chorionic villi. The perforation of the tubal wall by the villi may be excited by such violence as jumping from a train, straining at stool, jarring of a carriage, vomiting or sexual congress. Rupture may occur as a result of efforts to determine the diagnosis.

It was my misfortune to see a case of this kind in which the examination by me and subsequently by the attending physician was followed within a few minutes by symptoms of profound collapse. This confirmed the suspicion that an extra-uterine pregnancy was present. As soon as permission could be secured, the abdomen was opened and half a gallon of liquid blood was found within it. Although the vessel was secured, and every measure was taken to restore the patient she succumbed to the shock.

The tube is enveloped in two-thirds of its circumference by the peritoneum which forms a mesosalpinx. As the tube is enlarged by the developing embryo the mesosalpinx separates. This condition is true only of the internal two-thirds of the tube. The external third is not supplied with the mesosalpinx. The intraperitoneal rupture is three times as frequent as the extraperitoneal. In primary intraperitoneal rupture the embryo and its enveloping membranes, or a mole, are discharged into the abdominal cavity, and a certain amount of hemorrhage follows. The amount of blood extravasation will depend upon the period of pregnancy when the rupture occurs. When early, it may be slight. However, after the first month, it is copious—frequently sufficiently so to cause death in a few hours. I saw one patient who had missed her period but five days. She was taken with a violent pain at night, fainted several times, and was seen and subjected to operation the following morning. She was then extremely anemic and the abdomen was found to be filled with a large quantity of blood which had escaped from a cyst not larger than a bean, in the left Fallopian tube. The ligation of the bleeding vessel and the removal of the extravasated blood resulted in her restoration to health. Frequently the hemorrhage may be so great as to cause death in a few hours—even half an hour. When a rupture is deferred until the seventh week, the embryo or mole is not discharged constantly through the opening. The quantity of blood which escapes may be large, and demand immediate attention, or it may be slight in character, permitting the patient to escape the immediate dangers incident to the accident with slight shock. The effused blood may be absorbed and recovery ensue. When the discharge is not excessive, the blood collects in the rectovaginal fossa and floats the coils of intestine, forming an intraperitoneal hematocele as has been described.

Dangers of the intraperitoneal rupture are: 1. Hemorrhage so great as to cause immediate death; 2. The fatal result may be caused by repeated hemorrhage. In primary extraperitoneal rupture that portion of the tube not covered by peritoneum gives way and permits the discharge of the ovum and the accompanying blood between the layers of the mesosalpinx. Here the blood is forced into the connective tissue between the layers of the broad ligament, and, fortunately for the patient, the bleeding is checked by the pressure from the resisting tissues. Generally it is arrested before it assumes dangerous proportions. This lesion rarely causes trouble. Occasionally the rupture of the tube is slight, the embryo escapes partly, with its membranes remaining uninjured, and the pregnancy will continue. Rupture affords increased space for further development, and, the power of resistance being decreased, the ovum, as it increases in size, burrows between the layers of the broad ligament. The rupture may be gradual; the tube does not split suddenly, but, as its walls, through the gradual distention, become thinned, they yield in the part uncovered by peritoneum, until an opening forms and the ovum is extruded, accompanied by sudden hemorrhage. The extent of collapse and its duration will depend largely upon the amount of blood effused. The artificial opening gradually extends, the embryo and placenta make their way into the new area, and, unless the hemorrhage is sufficient to terminate the life of the embryo, the pregnancy is continued. This is known as a mesometric or an intraligamentary gestation. In this anomalous development of the ovum the placenta is liable to many changes which will influence the life of the fetus and the mother vitally. The tubal mucous membrane plays a very insignificant part in the formation of the placenta. The latter is developed mainly from the fetal tissues, as the tube does not develop a decidua. With the fecundation of the ovum there are at once developed changes in the uterine mucosa in preparation for its retention and sustenance. When the fecundated ovum is arrested in its progress and prevented from entering the uterus, the uterine decidua continues to develop as if the ovum were normally placed. This decidua, however, rarely is retained until the completion of gestation, but is thrown off during a false labor—frequently when the patient suffers from symptoms of tubal abortion or tubal rupture. The occurrence of this profuse bleeding after one or two months' amenorrhea, with the discharge of a cast or shreds of tissue from the uterus, which frequently may be enveloped by a large clot, leads the patient and her attendant to believe that a uterine abortion has occurred. When the patient goes to term, the uterine decidua is thrown off as a cast or in shreds during the early months of pregnancy. When the decidua is discharged in small fragments, this takes place without unusual pain; but *en masse*, the symptoms are similar to those of a miscarriage. The absence of the uterine decidua at the death of the ovum from rupture of the cysts, even in the early stages of pregnancy, is no proof that the membrane has not existed and been expelled before fetal death. When pregnancy occurs in one-half of a bicornate uterus, the decidua is present in the unimpregnated cornu. Under no circumstances, however, either in the normal or abnormal pregnancy, is a decidua found in the Fallopian tubes. As the destructive changes of the mucous membrane of the genital tract associated with menstruation are limited to the uterine cavity, so the true decidua is found in the same portion. It is sometimes important to avoid confounding the decidua of pregnancy with the cast thrown off from the uterus in membranous dysmenorrhea. In the former it consists of a compact layer of decidual cells. In the latter, the cast is more likely to involve a portion of the glandular structure of the uterus.

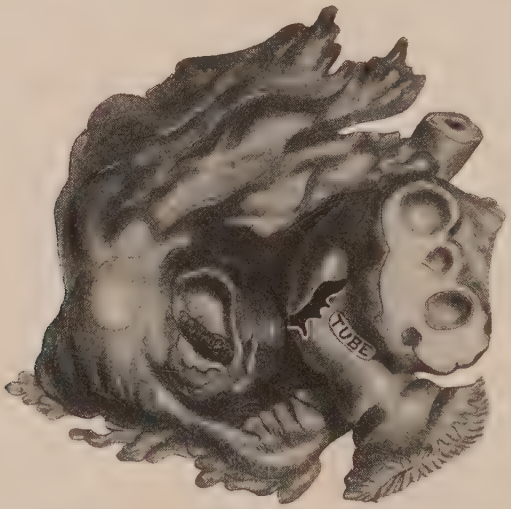


FIG. 454.—Complete Rupture of a Tubal Sac.

Rupture may be complete or incomplete. Complete rupture is one in which the ovum and its envelopes escape, either into the peritoneal cavity or into the broad ligament, with more or less profuse hemorrhage. (Fig. 454.) A partial rupture may result in the gradual thinning of the wall until it gives way in one place. When this takes place extraperitoneally, it is reinforced by plastic exudate, with the occurrence of little hemorrhage, if any. (Fig. 455.) Successive ruptures or partial ruptures thus occur until finally the envelope becomes sufficiently distended to permit the fetus to develop as in an intra-abdominal pregnancy.

At no time during such a rupture has the separation occurred between the placenta and the tube. In the extraperitoneal variety the embryo and placenta gradually occupy a sac formed by the expanded tube and separated layers of the broad ligament. The floor of this space is formed by connective tissue and the levator ani muscle. The ultimate effects depend to a great extent upon the original situation of the placenta. When the embryo is situated above the placenta, the latter is depressed between the layers of the broad ligament, until it is arrested by the pelvic floor. If the embryo lies below, and the membranes burrow between the layers of the broad ligament, the placenta is pushed up until it lies high in the abdomen. As there is no tubal decidua, the placental villi lie embedded in the decidual cells without any intervillous system existing. When the placenta is displaced into the tissues of the broad ligament, which occurs gradually, its structure becomes seriously damaged. The villi are less perfect in their contour, points of extravasation of blood are present, and blood-crystals are abundant. Finally, under the pressure, the placenta becomes gradually reduced to a mass of compressed villi; its serotina is destroyed and is replaced by blood-crystals and by organized blood-clot. While the consequences to the placenta from its displacement into the tissue of the broad ligament are thus marked, it is not attended with nearly so much danger as when the placenta is situated above the embryo. It is then subject to extreme disorganization, forming, as it does, the roof of the gestation sac. The changes that take place in the placenta, owing to the pressure of the developing fetus, have a great influence on the subsequent history of the pregnancy, in a marked degree imperilling the life of the mother. They are, in the majority of cases, disastrous to life in the fetus. The constant tension to which the peritoneum covering the gestation sac is subjected leads to partial detachment of the placenta and to severe hemorrhage, either into the gestation sac or into the peritoneal cavity. In the latter stages

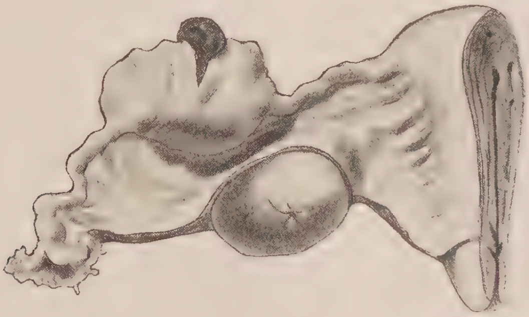


FIG. 455.—Incomplete Rupture of Gestation Sac.

of pregnancy, such hemorrhage almost invariably is fatal. A woman with an intraligamentary pregnancy, with a placenta situated above the fetus, runs a greater risk of losing her life than she would from placenta prævia. A tubal placenta which is situated above the embryo has its structure so damaged by rupture as to render it an inefficient respiratory organ, and the constant effects upon the embryo are very marked. The fetus from such a gestation rarely attains satisfactory growth. The fetus rarely lives more than a few days or weeks. Frequently it is ill-formed, suffering from hydrocephalus, club-foot, spina bifida, ectopia of the viscera, and other deformities. When normal in shape, it is exceedingly defective in size. One case is recorded in which the tubal sac contained two embryos measuring eleven centimeters in length. They were united by a band in the thoracic region. Dr. M. Price reported a well-formed ectopic fetus which survived operation and was healthy subsequently. The amount of hemorrhage in an incomplete rupture will depend much upon the situation of the placenta. If the placenta be attached to the peritoneal surface and rupture takes place over it, the bleeding will be excessive and possibly will result in the death of the patient unless prevented by surgical interference. If the placenta is situated on the opposite side to that on which rupture occurs, the envelopes may protrude, but little bleeding will follow, and the sac becomes reinforced by plastic exudate and adhesions. The sac wall is then formed by the uterus, the bladder, the parietes or pelvic peritoneum, and the coils of intestine.

A woman thirty-four years of age entered my service at the Jefferson Hospital, May 16, 1910. She had the following history: Puberty was established at the age of twelve years and the periods lasted from five to seven days with a free flow attended with dysmenorrhea the first two days. She was married at twenty-two years of age, and two years later, had a child after normal labor. She had enjoyed good health until March, 1909, when, without warning, she was seized with a severe attack of pain in the left lower abdomen. In the absence of any other apparent cause, her physician attributed this to a "cold." In a few days the distress subsided, and she experienced no further inconvenience until the following June. During this period her menstruation was regular. On the eighth of June she had a regular period which was accompanied by severe pain similar to the previous attack in March. Subsequently she was never free from abdominal discomfort and the menstrual flow for the next six periods was a muddy discharge lasting three or four days. During these later months an enlargement of the abdomen was noticed and in January of 1910 she felt what she believed to be fetal movements. These movements continued until March, after which they ceased. She had at this time a bloody discharge accompanied with severe abdominal pain. Her family physician made a diagnosis of ovarian cyst.

On admission to the Hospital the patient had a normal temperature, pulse and respiration rate. Her abdominal walls were thin and revealed an ovoidal tumor which was movable and not tender to pressure. The mass extended a hand's breadth above the umbilicus and filled the abdomen from side to side. While quite firm in consistency, it imparted the sensation of elasticity. The abdomen was opened on the nineteenth of May, by a long median incision and the intestines were packed back after separation of firm omental adhesions. The tumor was adherent at the pelvic brim and in the floor of the pelvis. These adhesions were separated without difficulty, the pedicle ligated and the mass removed. The tumor was the size of a small watermelon and weighed nine pounds. The mass was quite elastic, but solid portions could be recognized within it. (Fig. 456.) When the tumor was incised, a large quantity of dark brown fluid was discharged and a full term fetus revealed. (Fig. 457.) The fetus weighed four and a half pounds and measured eighteen inches in length. The patient was discharged on the nineteenth of June in good health.

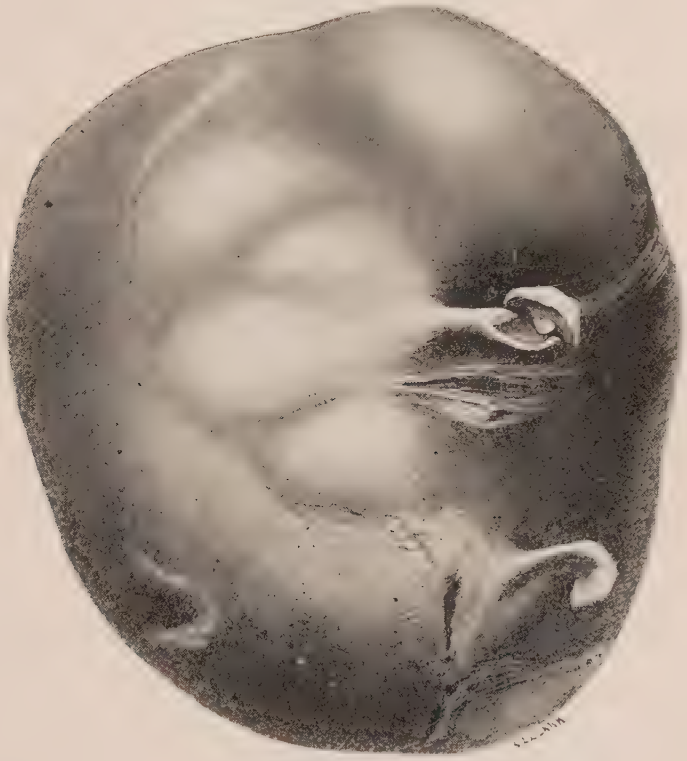


FIG. 456.—An Ectopic Gestation Sac Simulating an Ovarian Cyst.

Secondary Rupture. The extraperitoneal rupture causes the formation of a secondary broad ligament gestation sac which increases in size and may undergo rupture subsequently. The danger is much increased when the placenta is situated above the fetus. As the pregnancy progresses the peritoneum becomes stretched and is separated from the adjacent parts and the viscera. The sac extends into the abdomen and strips the peritoneum from the anterior wall to a greater extent than an overdistended bladder would. When the posterior peritoneum is thus raised up, the rectum, as well as the posterior surface of the uterus, may be deprived of serous investment. The placenta is insinuated between these parts, and secondary rupture may result at any time between the twelfth week and the completion of the term. The effects of this secondary rupture depend upon the injury to which the placenta is subjected.

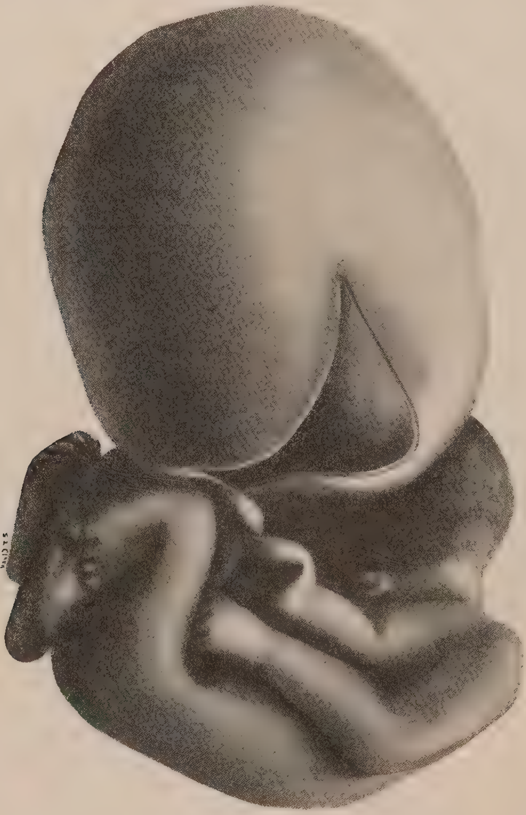


FIG. 457.—Sac Incised Exposing Full Term Fetus From an Ectopic Gestation.

After the middle period of pregnancy has passed, if the placenta is involved (as it is sure to be, owing to its position above the fetus) the consequence will be frightful hemorrhage and rapid death. Earlier in the course of the pregnancy the hemorrhage is not so severe, and may be arrested by prompt surgical intervention. Opening of the sac into the peritoneal cavity is recognized as secondary intraperitoneal rupture. If the fetus occupies the upper portion of the sac and the placenta is attached below, the former may escape among the intestines. Secondary rupture does not always occur. The patient may go to term, spurious labor follow, the liquor amnii be absorbed, and the placenta disappear. If the extra-uterine pregnancy has not been suspected, and its course not disturbed there may result the formation of a mummified fetus, or lithopedion, which may be discovered years later.

Secondary intraperitoneal rupture may occur at any time between the twelfth week and term. When it occurs at or near term, the belief is perpetuated that the fertilized ovum had tumbled into the peritoneal cavity, to ingraft itself upon the serous membrane and develop there.

The occurrence of primary peritoneal pregnancy is so rare as to render its existence exceedingly problematical. The cases of abdominal pregnancy with rare exceptions have their original development in the Fallopian tube. When it develops in the uterine end of the tube, particularly that portion which traverses the uterine wall, it is termed a tubo-uterine pregnancy. This form of pregnancy is not frequent, and readily can be confounded with pregnancy in one cornu of a bicornate uterus. The tubo-uterine gestation differs in its course, relations, and mode of termination from the purely tubal form. Primary rupture generally occurs before the eighth week, and the pregnancy is rarely continued without rupture beyond the twelfth week. The tubo-uterine gestation sac may rupture in two directions: into the peritoneal cavity, causing frightful hemorrhage and a rapidly fatal result, or, resistance being slighter toward the uterine cavity, the fetus and envelopes may be pushed into the uterus and terminate as in an intra-uterine conception. The intraperitoneal rupture is more rapidly fatal than in the tubal form, and causes severer hemorrhage, because the uterine wall is more vascular and the sac is situated in closer apposition to larger vessels. Tubal and tubo-uterine pregnancy have the following distinctive characteristics: tubal pregnancy is very common, tubo-uterine rare; the tubal gestation sac is very thin, the tubo-uterine very thick.

The termination can be: 1. Intraperitoneal rupture for each, or 2. Rupture into the intraligamentary space. In the tubo-uterine pregnancy, rupture can occur into the uterine cavity, with the discharge of the fetus through the vagina. 3. In the tubal, abortion can result, and, as in the primary rupture, date from the third to the twelfth week. In the tubo-uterine, rupture occurs at any time from the fifth to the twentieth week. Ovarian pregnancy, pure and simple, is extremely rare, and while there are cases in which careful examination has disclosed ovarian structure in the sac wall, with the tube free and unaffected, yet we are not prepared to admit that the condition may not have originated from the tube, for it is very doubtful whether the ovum will develop when not attached to the Müllerian structure. The majority of cases of ovarian pregnancy are undoubtedly tubo-ovarian, in which the embryo was originally situated in the orifice of the tube and has been partly extruded without loss of its vitality. As might be inferred, the life of the embryo in a tubal pregnancy is necessarily precarious. After rupture, undoubtedly the pregnancy may continue until full term. Symptoms of labor set in, during which the gestation sac may burst into the peritoneal cavity. If this catastrophe is avoided, the fetus dies. The body remains quiescent or produces various forms of disturbance. Thus, the liquor amnii is absorbed; the tissues of the fetus become mummified or partly calcified, and form a lithopedion. The softer parts are converted into adipocere or undergo other forms of decomposition. The placental tissue is gradually absorbed and disappears.

Mummification is attended with absorption of the fluids, while the soft parts are converted into a dried tissue similar to that which follows when a dead cat permitted to remain under an old building, becomes a dried cat. An extra-uterine fetus can be retained in the body for a long period of time. Cheston reports a lithopedion carried for fifty-two years; Barnes, one forty-two. That a fetus may be carried this length of time does not necessarily indicate that it will not prove a source of danger to the patient. That these gestation sacs may be carried for a long time is illustrated by the following history of a patient in my service at St. Joseph's Hospital. A German woman, thirty-four years of age, came to this city ten years before her admission to the Hospital. She has given birth to three children after normal labors and never had an abortion. For ten years she had an abdominal tumor, the history of which was indefinite. It afforded no signs to indicate an ectopic gestation. Six months prior to her admission she was taken with severe pain in the right pelvic region and had frequent attacks of fainting. The tumor became tender to pressure and locomotion was impossible. These acute symptoms subsided after a few days, but the patient was incapacitated from this period until her admission. She then had to the right of the umbilicus a tumor which was slightly movable, irregularly nodular and dense in consistency. It was supposed to be a parasitic fibroid. When the abdomen was opened, a large fetal-head-sized mass was revealed. As the tumor was separated its connection with the right Fallopian tube was rendered evident. It was enveloped in the omentum and adhered firmly to the mesentery. After its removal, the stump was sutured, the

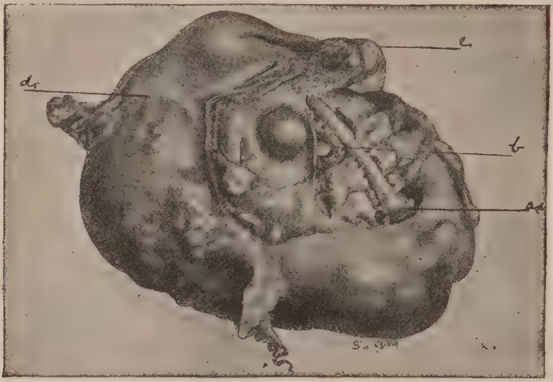


FIG. 458.—Calcified Ectopic Gestation Sac Carried Over Ten Years (*a*, Femur; *b*, Tooth; *c*, Tube and Ovary; *d*, Orbital Plate of Frontal Bone).

hypertrophied omentum removed in sections, and the torn mesentery was sutured. The patient had an uninterrupted convalescence and was discharged in twenty-five days. The specimen removed weighed three pounds and contained much calcareous material in the sac wall. On its surface could be seen the femur, a tooth, and the outline of the orbital plate. Pathogenic micro-organisms can find entrance to the sac through the adjacent hollow viscera, and at any time produce serious trouble. Suppuration follows, pus finds its way through the sac-wall, and penetrates the vagina, uterus, bladder, or rectum. Through any of these openings fragments of fetal tissue escape from time to time, causing frightful distress and necessitating operation for relief. The existence of a lithopedion or macerated fetal skeleton does not preclude subsequent pregnancy. One case came under my observation in which a woman with a good-sized and distinctly well-defined lithopedion gave birth to two children.

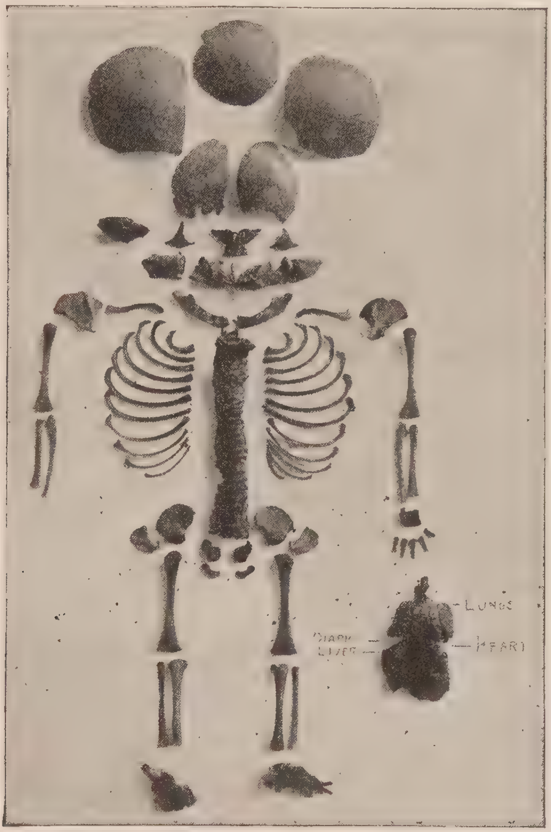


FIG. 459.—Photograph of the Skeleton Dissected and Arranged from the Original Specimen Seen in Former Figure.

Symptoms which should lead one to suspect the existence of an ectopic gestation are dependent upon the duration and course of the pregnancy. A history will be obtained of disordered menstruation, the patient having missed one or more periods. The ordinary symptoms of pregnancy are present and she has supposed herself pregnant. She may have experienced a sensation of uneasiness or distress over the region of the ovary and tube upon one side, associated with frequent and sudden attacks of colicky pains. These pains may have been of severe, cutting character, paroxysmal, and occasionally intense. In other cases without any premonition pain of a tearing, cutting character will occur, so severe and lancinating as to cause the patient to fall and become unconscious. This phenomenon may be followed by repeated attacks of syncope in which the countenance of the patient becomes pale, anxious and covered with clammy perspiration. The lips are pale and blanched, respiration is sighing, the sight obscured, there is a sensation of darkness or even blindness, frequently her mind wanders, she may remain unconscious, or pass from one attack of syncope to another. The pulse at the wrist becomes exceedingly feeble, faint, and imperceptible. The temperature is subnormal, and all the indications of approaching dissolution are present. Generally the symptoms are not so marked. The patient is weak, debilitated, shows symptoms of shock or collapse, soon rallies, with recurring attacks of a similar character, which indicate that the hemorrhage has again recurred or is slowly continuing. In other cases the progress is insidious. A small aperture exists; the walls have been stretched. Plastic exudation is thrown out and the pregnancy may progress without further accident. The tube may rupture either intraperitoneally or extraperitoneally. The symptoms of the two varieties will be found entirely different. The gravity of the former is much greater, but will depend upon whether the rupture has been complete or incomplete, and also upon the situation of the placenta. When the rupture occurs from the site of the placenta, even though incomplete, hemorrhage can be so severe as to cause the death of the patient if intervention is not instituted. According to the intensity of the hemorrhage, the patient may either die in the first attack, that is, within half an hour or an hour after the first symptoms or rally slightly with an apparent recurrence of the hemorrhage, followed by death within less than twenty-four hours. Should the patient survive twenty-four hours and rally, her strength may gradually return and recovery follow, though a secondary hemorrhage may develop and result in a fatal termination. When the patient survives the hemorrhage and shock, the accident is followed by more or less tenderness over the abdomen and by abdominal distention, symptoms indicating the occurrence of localized peritonitis. In the early stage of hemorrhage no physical signs of its existence can be recognized. Possibly a large quantity of blood in the abdominal cavity of a thin woman could be recognized by the sensation of fluctuation. In twenty-four hours the blood will accumulate in the pelvis, and we then observe a sensation of fluctuation and slight resistance by vaginal palpation. Change in the position of such a patient permits the collection to flow out of the pelvis, when its presence will no longer be recognized. If the pelvis is lowered again, the accumulation returns. The coagulated blood causes more or less irritation, which results in the exudation of plastic material and the occurrence of a localized peritonitis. The abdomen becomes tender to the touch, febrile reaction occurs, and the temperature, instead of being subnormal, now rises to 101° F. or even 103° F. The patient may experience distress from pressure of the mass on the rectum or against the uterus and bladder, which produces frequent micturition—even incontinence. With the advent of plastic peritonitis the collection becomes encysted. The patient will often suffer from nausea and abdominal distention. The watery portions in such a collection become gradually absorbed and the mass is more apparent and resistant. The uterus may be pushed upward and forward. The intestines are raised up and form a part of the wall of the sac. The collected mass varies in its consistence: sometimes it is hard, sometimes soft, or the same mass may have several points of softening. The uterus may be enveloped by the collection, producing what is known as an enveloping uterine hematocele; the functions of the rectum and bladder may be impaired greatly by the compression of the mass against these organs, often causing symptoms of intestinal strangulation and retention of urine. Pressure upon the nerves of the pelvis frequently produces severe neuralgia of the lower extremities. Even when suppuration does not occur, irregular attacks of fever frequently are the result of peritoneal reaction. The course and progress of the disease are essentially chronic, though repeated attacks may occur. The congestion which takes place at the menstrual periods may result in acute symptoms. Suppurative change in such a collection is ushered in by an aggravation of both the local and general symptoms, chills, elevation of temperature, profuse sweating, leukocytosis; the tumor increases in size and undergoes softening; the mass may subsequently perforate into the rectum, causing the evacuation of dark, purulent, exceedingly offensive material in the stools, which may cause more or less irritation of the rectum. These discharges are followed by cessation or disappearance of the tumor. Perforation into the vagina or bladder may occur, though these are rare. Perforation into the abdominal cavity is fortunately infrequent. When it does result, a violent attack of general peritonitis follows. The occurrence of rupture of the tubal sac is frequently associated with discharge of blood from the vagina and severe uterine pain. The uterine pain or the pain from the rupture may cause the victim to believe that an abortion is impending. This suspicion may be confirmed still further by the discharge of a cast from the uterus or of shreds of tissue, associated with clots, leading both the patient and her medical attendant to believe that an abortion has occurred. When the hemorrhage is slight and the ovum retains its connection with the tube, the fetus may continue to full development, and even reach full term. A pregnancy situated posterior to the uterus may reach full term without causing the patient to suspect that an abnormal condition exists. It is only after the beginning of labor, when an examination is made, that the true state of affairs is recognized. Even then it is not always recognized and the spurious labor may terminate without the discharge of the fetus and the sac undergo subsequent changes.

Diagnosis comprises: 1. The recognition of extra-uterine pregnancy preceding rupture; 2. The determination of rupture or abortion with intraperitoneal or extraperitoneal hemorrhage and death of the fetus; 3. Secondary rupture; 4. Continued growth of the embryo after rupture; 5. Peritonitis; 6. Suppuration.

1. *Preceding Rupture.* Frequently the victim of misplaced conception does not apply to her physician until the occurrence of a violent, tearing pain, indicating rupture. The distressing symptoms prior to this occurrence are rarely sufficiently definite to demand a physical examination. Such an examination is generally requested in order to ascertain the existence of the supposed normal pregnancy. However, the frequent occurrence of ectopic gestation should lead to the careful investigation of every patient who gives symptoms of being pregnant, where there is a previous history of more or less extended sterility, of attacks of pelvic inflammation, especially if the latter has originated from gonorrheal infection. Such an examination is particularly indicated when the patient, having missed a period, complains of a sensation of uneasiness or distress in one side of the abdomen, associated with frequent and sudden attacks of colicky pain. Every such patient should be subjected to a careful examination. Slight enlargement of the uterus, with some tenderness in the pelvis, more marked upon one side, associated with a more or less spherical or rounded distention of the tube, should increase the suspicion of ectopic gestation. This suspicion would be confirmed by finding increased vascularity in the broad ligament, causing marked pulsation of its vessels. This pulsation is distinctly recognizable upon the affected side, while the pulsation on the opposite side is not defined. The examination should be made with the utmost gentleness, for rough manipulation or marked pressure in the practice of the bimanual procedure can very readily rupture a sac which is so thin as to require only slight amount of additional pressure. Where the sac is of considerable size, it is unwise to subject it to much force in the examination, unless the operator is prepared for immediate operation should rupture occur. It has been my unfortunate experience with a patient in whom the pulsation was as distinct as if the finger were placed over the radial artery, to have the sac ruptured by her physician, during examination. The patient succumbed to the subsequent operation. Dr. J. M. Fisher, my assistant, reports two cases in which he has observed the rupture of an ectopic gestation during examination.

2. *Rupture* of an ectopic gestation sac may be suspected when the patient gives a history of having failed to menstruate for one or two periods and has exhibited the ordinary symptoms of pregnancy. She has probably had more or less discomfort upon one side, with frequent colicky attacks, when suddenly, without warning, there has been an attack of most violent, tearing pain, followed by syncope, all the symptoms of internal hemorrhage, with oncoming collapse. I have seen such a patient

in the space of ten minutes pass from a condition of apparent good health to one which seemed to threaten approaching dissolution. The face was blanched, pale, exceedingly anxious looking, covered with cold, clammy perspiration; the pupils dilated, eyes expressionless, rolling from side to side; sighing respiraton; pulse rapid, feeble, sometimes almost imperceptible. The patient complained of being unable to see, everything appearing dark about her. Sometimes marked nausea and vomiting are present. The slightest movement, even raising the head of the patient, is followed by more or less profound syncope. Such a train of symptoms should awaken in the mind of the observer the absolute conviction that an internal hemorrhage is occurring, and the association of such a group of symptoms would indicate its origin from an ectopic gestation. A physical examination affords very little information, for at this time the tumor is insufficiently large and without the necessary firmness to afford the sensation of resistance. The physical signs are consequently indefinite. When bleeding is extensive, and the abdominal walls thinned and not very resistant, a sensation of distention may be noted and even fluctuation recognized. When the hemorrhage is not so profound as to endanger life, the watery portions of the effused blood are gradually absorbed and leave a more or less resistant clot, which can be felt as a firm mass in the pelvis. In the absence of previous history of recent inflammatory trouble or the previous existence of a growth, it must be recognized as effused or clotted blood. The accumulation is generally retro-uterine. A large extravasation may fill the pelvis, push the uterus forward, and raise the intestines above it. (Fig. 446.) In other cases the uterus may be found in a state of retroversion, while a mass is situated in front and forms an ante-uterine hematocele; or in very large accumulations the uterus may protrude through it, producing what is known as a circumuterine hematocele. Hemorrhage dangerous to life, and productive of the most profound anemia, may arise without rupture, as in tubal abortion, or when the villi have penetrated the wall of the tubal sac and bleeding occurs from their surfaces. These perforations may be so minute as to be unrecognizable by the naked eye, except for a thrombus projecting from the external tubal surface. The tubal abortion in its earliest stage causes no marked physical manifestations outside of those symptoms which indicate an internal hemorrhage. Later, however, percussion will be dull over the flank and lower abdomen and the blood-clots in the tube, filling up the sac, produce a large, sausage-shaped mass, which may be firm and resistant. The patients in whom rupture has occurred may present successive attacks of shock and syncope. Thus, a patient bleeds until the blood pressure is greatly reduced. A clot forms, plugs the vessel temporarily, and the circulation is restored. If, however, injudicious efforts are made to revive the patient by hypodermatic injections of strychnin, digitalin, or intravenous injection of salt solution, the clot is washed or driven out and hemorrhage again recurs, with a repetition of the former symptoms. Noble has reported cases in which the rupture and hemorrhage have been associated with a rather rapid and marked rise of temperature. The general rule, however, is that where hemorrhage is marked the patient shows a subnormal temperature, as would be expected in cases of shock and threatened collapse. The temperature rarely is elevated until some days after the hemorrhage and then is not high. Undoubtedly, the elevation of temperature is due to degenerative changes in the collection, possibly from the fibrin-ferment, or more likely from partial infection by organisms from the intestinal canal. At the time of this elevation of temperature the peritoneal exudate is thrown out. This forms barriers and confines the blood accumulation within the pelvis. The watery portions of the blood become absorbed, until a more or less distinct and well-defined mass of clotted blood is perceived. In extraperitoneal hemorrhage the symptoms are much less acute. Shock or collapse is less marked, although we still have symptoms which, to a limited degree, should lead one to suspect internal hemorrhage. Examination will disclose on one side of the pelvis a mass which may fill up and distend the broad ligament. The tumor may be quite tense and push the uterus to the opposite side. The condition differs from tubal disease in that the broad ligament is distended by it. There has been an absence of recent inflammatory trouble, and the patient does not present the characteristic symptoms of inflammation. In the intraperitoneal variety the irritation of the accumulated blood causes certain reactive symptoms and sometimes the development of peritonitis. The temperature becomes elevated, pulse rapid, the abdomen tender and sensitive to pressure, but the symptoms are not so acute as in marked inflammation. The rupture and internal hemorrhage are usually associated with a discharge from the uterus of decidual membrane, either as a complete cast of the cavity or in the form of shreds mixed with clots. The cast may show the orifice of the Fallopian tubes and internal os. Inquiry should be made with regard to this symptom, and, when possible, the discharged material should be carefully examined. It is important to differentiate it from the decidua

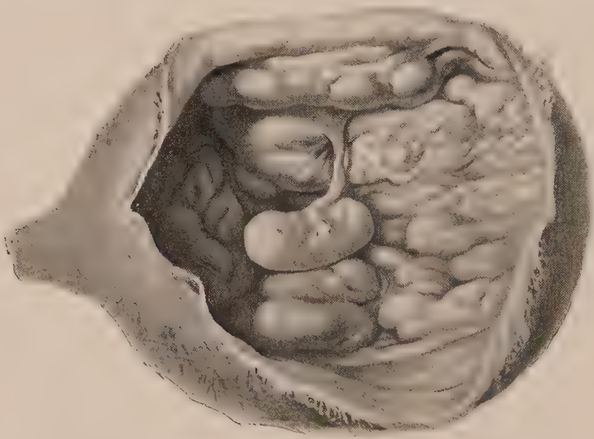


FIG. 460.—Ectopic Gestation Sac Ruptured, Showing Fetus.

thrown off in some forms of dysmenorrhea. That of pregnancy is from six to eight millimeters in thickness, while that of menstruation rarely exceeds two or three centimeters in length and is scarcely two millimeters in thickness, is translucent, rarely passed entire, and consists of the compact layer of the epithelium. When the symptoms have been slight and the woman has considered herself the subject of an abortion, she may not present herself for examination until the enlarged fetal sac causes a suspicion of the continuation of the pregnancy—even then, she may not consult a physician.

3. *Secondary rupture* necessarily follows a primary rupture, which, in the majority of cases, has taken place in the broad ligament. The rupture has occurred in such a way as not to interfere with the vitality of the ovum. Retaining its vitality, it enlarges its implantation, and in its growth spreads out the broad ligament until the latter is no longer able to retain it, when from pressure the thinned wall finally ruptures and severe hemorrhage takes place into the peritoneal cavity. The history of repeated attacks of pain and distress, of symptoms of internal hemorrhage, of the enlarging abdomen, and, finally, the cutting, agonizing pain associated with rupture into the peritoneal cavity should be sufficient data upon which to base the diagnosis of secondary rupture. Both in primary and secondary rupture the amount of hemorrhage will depend upon its relation to the site of the placenta. Where the rupture takes place over the latter, the hemorrhage may be very profound and so rapid as to result in death of the woman before measures can be instituted for her relief.

4. *Continued Growth of the Embryo after Rupture.* Growth may take place in the broad ligament, spreading it out, or, in those cases in which the embryo has become reimplanted upon the surface of the peritoneum, the ovary, or in a continuation of the tube, the growth advances as it would in ordinary pregnancy. The fetal movements are recognized, the enlargement continues, and the patient imagines herself normally pregnant. On physical examination of such a patient the parts are more distinctly defined by bimanual palpation than if the mass were situated within the uterus, as there is less structure intervening between the fetus and the palpating hand. Recognition of the fetal heart sounds is absolute indication of the existence of pregnancy. After the completion of the normal term of pregnancy in such a patient the appearance of spurious labor, the cessation of fetal movements, and the changes which come under observation months later, may greatly increase the obscurity of the condition.

A patient came under my observation who supposed herself pregnant. She suffered from a bloody discharge, with considerable pain, at the end of the second month, which led her to think that an abortion had occurred. The supposed abortion occurred in February. Her abdomen consequently became enlarged, and in the following October she went into labor. Pains continued for two days, and after the movements ceased her menstrual periods returned. In April she presented a tumor as large as in a pregnancy at full term, over which there was distinct fluctuation and marked resonance. A thin-walled sac was recognized, but no resistant mass. Vaginal examination disclosed behind the uterus a tumor which filled

Douglas' pouch. The uterus was enlarged and was situated directly in front of the tumor. Percussion gave resonance everywhere. No dulness could be distinguished although fluctuation was distinct. The diagnosis was an ectopic gestation, with death of the fetus, decomposition in the fetal sac, and the formation of gas. This diagnosis was confirmed by opening the abdomen and finding posterior to the uterus a sac which contained a macerated fetus and a considerable quantity of offensive fluid.

5. *Peritonitis* may take place as a result of rupture of the sac, the escape of its contents into the peritoneal cavity, the accumulation of blood from a large hemorrhage, and its irritation upon the pelvic peritoneum. Unless relief is afforded, extensive matting together of the intestines and pelvic structures occurs, requiring early operative interference for relief. Peritonitis may be produced, also, by the death of the fetus and infection of the sac. Its occurrence is indicated by pain and tenderness over the abdomen, distention of the belly, assumption of the dorsal position, and distress during the evacuation of the bladder or movement of the bowels.

6. *Suppuration.* Suppuration in an ectopic gestation may follow its rupture, so that the contents of such a sac become sanguinopurulent. Suppuration also takes place in later stages of a pregnancy which has gone on to full term; the fetus has subsequently become macerated, mummified, or even a lithopedion has formed. Suppuration may occur months or even years after a pregnancy, and lead to the evacuation of the sac or to its rupture into the intestine, the bladder, the vagina, or through the abdominal wall. Fragments of the fetus and its bony structure will be discharged. Suppuration will be indicated by increased pain and distress, by recurring chills, sweating, elevation of temperature, and the ordinary symptoms associated with suppurative processes. That the suppuration originated in an ectopic gestation will be demonstrated by the previous history of the case. This is made absolutely certain when the bony fragments of the fetus are discharged.

Differential Diagnosis. Tubal and uterine pregnancy may coëxist. Uterine may follow tubal pregnancy, or repeated uterine pregnancies may occur subsequent to the formation of a lithopedion. Tubal pregnancy may be bilateral. Its frequent occurrence in the remaining tube after removal of a tubal gestation sac has led some operators to advocate the removal of both appendages in every case of tubal gestation. Tubal pregnancy may coëxist with ovarian and tubo-ovarian tumors. In a case I saw with Dr. J. M. Fisher the symptoms justified his diagnosis of rupture of a tubal gestation sac. From its outline a mass upon the left side of the pelvis was considered to be a large extraperitoneal hematocele, which I decided to evacuate by a vaginal incision. A large quantity of clotted blood was evacuated, above which was a smooth cyst, too large to remove through the vagina. The ruptured tubal gestation sac was upon the opposite side. The removal of the cyst was effected by an abdominal incision.

The following conditions may be confounded with ectopic gestation: 1, uterine pregnancy; 2, pregnancy in a bicornate uterus; 3, a retroflexed gravid uterus; 4, spurious pregnancy; 5, ovarian tumors; 6, uterine tumors; 7, intraligamentary tumors; 8, accumulation of feces in the rectum.

1. Uncomplicated uterine pregnancy is generally more easily recognized by the change in shape and size of the organ. In ectopic gestation the jug-like shape or outline of the fundus is wanting. A sac or mass, rather sharply defined, will be found in one of the tubes, if rupture has not occurred, and the subjacent vessels will pulsate more distinctly than upon the opposite side. After rupture the condition is distinguished by more or less severe shock, profound anemia, and the appearance of a large mass in the pelvis without a history of previous inflammatory phenomena. The introduction of the sound and the use of the curet to secure decidual tissue have been advocated, but these procedures are not free from danger. In possible uterine pregnancy and abortion the danger of infection must not be overlooked. The investigation for decidua may be misleading, as it previously may have been exfoliated. The tissue removed by a curet cannot be certainly distinguished from that which will be caused by inflammation. The procedure endangers the development of septic processes, and will complicate a tubal gestation if any exists.

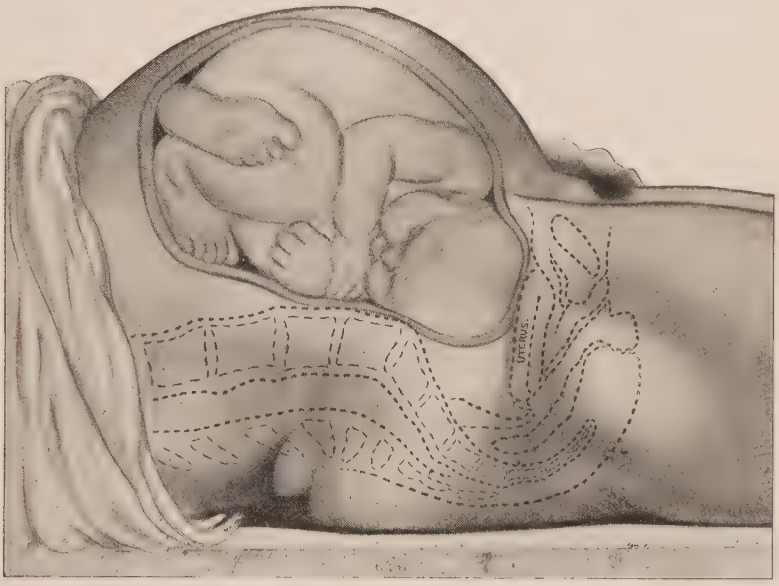


FIG. 461.—Large Ectopic Gestation Sac.

2. Pregnancy in one horn of a bicornate uterus may be impossible to differentiate from a tubo-uterine or an interstitial pregnancy. Fortunately, the treatment of the two conditions is similar, and is almost equally urgent. A tubal gestation is situated at a greater distance from the uterus.

3. The retroflexed pregnant uterus is recognized by palpation. We are able to trace the tumor back from the cervix, and the smoothly outlined fundus is capable of considerable movement.

4. Careful analysis of the symptoms, associated with the accurate consideration of physical signs, will guide to a correct diagnosis. After the abdomen has been opened, it is a grave error to mistake an extraperitoneal pregnancy for sarcoma or myoma.

5. Ovarian tumors are usually differentiated by their history. It is only when one of these growths has produced no symptoms by which its presence could be suspected, and is suddenly complicated by an acute attack, during which or subsequent to which examination discloses its presence more or less fixed in the pelvis, that error is possible. Such a train of symptoms is readily produced by twisting of the pedicle of a small ovarian or a broad-ligament cyst. I saw a young unmarried woman who presented a history of having had a severe attack of pain upon the right side, which was pronounced appendicitis. A movable mass could be felt above the brim of the pelvis upon the right side, but there was no inflammatory exudation. Notwithstanding her good character, ectopic gestation was regarded as a possibility. Abdominal incision disclosed a broad-ligament cyst beyond the ovary, closely attached to the outer part of the tube, whose pedicle had twisted, causing hemorrhage into the cyst and twisted portion of the tube, with the effusion of a large quantity of free bloody serum in the peritoneal cavity.

6. When, in an extra-uterine pregnancy, the fetus is dead, the fluid portions have been absorbed, and the mass is hard and firm, with its sac closely adherent to the side of the uterus, the physical signs are frequently insufficient to establish the differential diagnosis between it and an intraligamentous myoma.

7. Intraligamentary tumors are easily confounded with ectopic gestation. Frequent'y the diagnosis can be determined only after abdominal incision. A patient was brought to me with the following history: married nine years she had never been pregnant; six weeks before admission she was seized with severe pain in the left side, and subsequent inflammatory symptoms, which confined her to bed the greater portion of the time. A mass, quite resistant, and firmly fixed by adhesions was felt to the left and in front of the uterus. The long period of sterility, sudden onset, and more or less fixed tumor, not previously recognized, led me to suspect tubal gestation with intraligamentary rupture. The incision, however, disclosed an intraligamentary ovarian cyst. The thick walls, which had undergone a degenerative process, probably explained the sudden onset.

Not infrequently the diagnosis can be determined only by incision. An ectopic gestation is found when operations are performed for other conditions, and the reverse.

8. Careful examination should exclude fecal accumulation. Ordinarily, the latter condition is determined by the possibility of indenting the fecal masses. When there is any doubt, an expression of opinion should be withheld until a complete evacuation of the bowels can be secured by an active purgative, supplemented by free rectal enemas.

The differential diagnosis of tubal rupture is often difficult. Rupture is simulated by lesions of the abdominal viscera, such as perforating ulcers in the stomach, duodenum, small intestine, and vermiform appendix; rupture of a pyosalpinx; torsion of the pedicle of a small ovarian cyst; acute intestinal obstruction; renal and biliary colic. A case of tubal gestation has been brought to operation as a supposed strangulated hernia. The diagnosis of tubal rupture can always be rendered certain by a puncture through the posterior vaginal fornix, when the rupture will be indicated by the discharge of dark-colored blood. The vaginal puncture, affords in addition, opportunity for the digital exploration of the pelvic viscera. Such an investigation permits palpation of the tubes and ovaries and the recognition of existing abnormalities.

The following table, modified by Greig Smith from Webster, presents in a convenient form a summary of the pathologic and clinical features of ectopic gestation:

ECTOPIC GESTATION.

- AMPULLAR GESTATION beginning in the ampulla of the tube.
  - *Persisting* (rarely goes to full term).
  - *Rupture* (the usual result):
    - Into broad ligament:
      - Gestation continues there.
      - Secondary rupture into peritoneal cavity.
      - Gestation terminates:
        - By formation of hematoma.
        - By suppuration.
        - By mummification.
    - Into peritoneal cavity:
      - Gestation continues, the placenta remaining in the tube, the fetus and the membranes being in the cavity; or
      - Secondary implantation may occur on the peritoneal surfaces.
      - Gestation terminates:
        - By death of patient from hemorrhage or shock.
        - By absorption of the mass.
        - By mummification or by adipocere or lithopedion formation.
        - By delivery of fetus through surgical procedure.
  - *Destruction* of gestation:
    - By tubal abortion.
    - By formation of mole.
    - By hematosalpinx.
    - By suppuration.
    - By absorption after early death.
- INTERSTITIAL GESTATION developing in the intestinal portion of the tube.
  - *Persisting* (the gestation may go to term).
  - *Rupture*:
    - Into the peritoneal cavity.
    - Into the uterine cavity.
    - Into both the peritoneal and uterine cavities.
    - Between layers of broad ligament.
  - *Destruction of gestation and retrogressive changes in fetus and envelopes.*
- INFUNDIBULAR GESTATION in the outer end of the tube. The ovary may form part of the wall of the sac.

Prognosis. Extra-uterine pregnancy at any stage of its progress must be regarded as a condition fraught with the greatest peril to the patient. It should be regarded as just as positive an indication for treatment as would be the presence of malignant disease. If discovered before the rupture of the sac, the patient is in danger from hemorrhage. The longer the condition progresses, the graver is the peril. After rupture, with death of the fetus, the patient is not free from danger, as the collection of blood—the hematocele—may become infected from its proximity to the hollow viscera, and cause the formation of an abscess or the development of pyemic symptoms. If the fetus survives the rupture, its subsequent development only increases the danger. A secondary rupture, with escape of the sac contents into the peritoneal cavity, or the frightful hemorrhages which result in some conditions, may prove immediately fatal. The woman may go on to full term and the fetus die, then undergo retrogressive processes, which may at any time, even after years of quiescence, become infected, and result in the formation of abscesses, perforation of viscera, and escape of the contents of the sac. As the nutrition of the fetus in the majority of cases is defective, from unfavorable implantation of the placenta, frequently from pressure upon it, the fetus is generally imperfectly developed, often undersized, suffering from hydrocephalus, spina bifida, club-foot, and other deformities. The preservation of the life of such an individual should not be considered when it is recognized that the life of the mother is constantly in peril. Furthermore, the fact should be taken into account that, even under the most favorable circumstances, the chances for the fetus are very greatly decreased, and that, even when delivered alive, its duration of life is short. The statistics of Dunning, however, indicate that an operation for the delivery of the child during life, when viable, is more favorable for the life of the mother than is the delay of the operation until after the death of the fetus.

Treatment. In a condition replete with such dangers as that of ectopic gestation it does not seem the province of the physician to practise any other method than one which will afford the greatest certainty of relief and can be accomplished with the least danger. This, in my judgment, is through surgical manipulation; but, as other methods of treatment have been advocated, before entering upon the consideration of extirpation, I will consider the substitutes. The substitute methods recognized are evacuation of the liquor amnii, injection of poisonous substances, elytrotomy, and the application of the electric current.

The evacuation of the liquor amnii was advocated by Simpson in 1864. He treated a case by puncturing the cyst through the vagina without killing the child, but the mother died in three days. Braxton Hicks tried a similar method in 1865, which killed the child, and the mother died of hemorrhage. Greenhalgh, in 1867, had a successful case. James, of Philadelphia, in 1867, had a successful case after much tribulation. Owing to the great mortality, this plan of treatment has been generally abandoned.

The injection of poisonous materials into the fetus and its enveloping fluids was advocated by Joulin in 1863. Morphin is the drug most frequently used. Other remedies, such as strychnin and ergotin, have been employed similarly. Inunctions of mercury, the administration of potassium iodid, and repeated bleeding have been advocated, but it is difficult to explain why. The injection of morphin with a hypodermatic syringe is practised before the fifth month. Two injections are usually given, containing 1/2 of a grain each, at an interval of from eight to fifteen days. The treatment may result in severe hemorrhage, septicemia, and perforation of an intestinal loop, so that, while apparently a simple procedure, it is attended with greater danger than an abdominal operation.

Elytrotomy, or the removal of the fetus and its contents through a vaginal incision, was instituted as early as 1817 by Dr. King, of Georgia. This operation, which has been lately revived, is not by any means a new one. In the discussion of hematocele vaginal incision has been advocated as a justifiable method of procedure when the condition has become chronic; in other words, some time after the hemorrhage has taken place, when the vessels are occluded and the fetus is more than likely to be dead. In such cases vaginal incision affords an opportunity for clearing away the débris without subjecting the patient to so serious an operation as would be that through the abdominal wall. But before rupture, or immediately following rupture, in order to arrest the hemorrhage, the abdominal incision should be preferred. When the patient has reached full term and the death of the fetus has occured, but as yet without the appearance of suppuration, the vaginal procedure may be chosen: 1. When the fetus presents the head, breech, or feet, so that it can be extracted without altering its position; 2. when it is certain, from the thinness of the structures separating the presenting part from the vaginal canal, that the placenta is not situated over this part of the sac, and we are not absolutely certain that the placenta may not be inserted on the anterior abdominal wall. If it is necessary to turn the child in order to deliver it, the vaginal procedure should not be considered. Robertson advocates dividing the perineum, septum of the vagina, and rectum, but this is an unnecessarily severe proceeding.

The application of electricity for the destruction of the fetus has been practised since 1853. There is a difference of opinion, however, among electrotherapeutists as to the greater value of the faradic and galvanic currents, each having its advocates. This procedure is preferable to all those named, but is advisable only in the earlier months of pregnancy. In the early stages we must take into consideration the fact that the diagnosis is not always certain. Without doubt, many of the cases reported to have been cured by electricity were cases which had undergone rupture, and in which the tubal mole or embryo had escaped and lost its vitality, and the electric treatment has possibly served to expedite the absorption of the exudation—an absorption which would have taken place had electricity not been applied. Many cases in which electricity has been applied were undoubtedly cases of mistaken diagnosis. It is true that advanced methods of examination will differentiate the condition more certainly, but the violence required to accomplish this will greatly endanger the rupture of the fetal sac. The application of electricity has occasionally been found to intensify the contraction of the muscle-fiber of the tube and to result in rupture and severe hemorrhage. When the death of the fetus occurs the danger does not cease. We frequently find the placenta continuing to grow, or rupture may follow, associated with severe hemorrhage and later with septicemia. In the application of the current one pole of the battery (generally the negative), is applied through either the rectum or the vagina in the neighborhood of the ovum. The other pole or a large electrode is applied to the abdominal wall directly over the sac and an inch or more above Poupart's ligament. The current is used for five to ten minutes, increasing it as the sensitiveness of the patient will permit. When necessary, the application should be repeated. The practice of this procedure is of doubtful utility, and, as has already been mentioned, it is not without danger. It temporizes with a condition which menaces life and may excite severe tubal contractions which often result in rupture with subsequent hemorrhage.

The risks and difficulties of operative treatment will largely depend upon the stage of gestation and the condition of the placenta and gestation sac. The surgeon, to be properly prepared to meet all emergencies, should consider:

1. The measures to be employed before primary rupture or abortion.
2. The measures required at the time of primary rupture.
3. The treatment required after rupture:
   a With intraperitoneal hemorrhage.
   b With extraperitoneal hemorrhage.
4. The treatment advisable in advanced growth of the embryo:
   a The child alive.
   b The fetus dead, mummified, or reduced to a lithopedion,
   c Following decomposition of the fetus and suppuration of the sac.

1. *The Measures to be Employed before Primary Rupture or Abortion.* Cases in which opportunity is afforded to operate prior to the rupture of the sac are more frequent than formerly, owing to our improved methods of diagnosis and to the greater significance given to disorders accompanying pregnancy. Too frequently still, the disorder will be overlooked until the danger-signal of rupture appears. When the symptoms present make it evident that an ectopic gestation exists or is extremely probable, the patient should be subjected to operation at the earliest possible moment. The danger arising from rupture is so great that the patient should be considered in peril of her life until the condition is corrected. The abdominal incision is the preferable procedure, inasmuch as it affords a better opportunity to explore the field, to manage adhesions, and to secure bleeding vessels. The removal of the entire sac rarely affords any special difficulty. In a tubo-ovarian pregnancy it is possible that a knuckle of intestine may have become adherent to the sac. In such cases the removal of the latter must be carefully managed, because the changes which take place in the adherent intestine render it easily torn. In my own experience, failure to recognize this possibility led to the necessity of resecting a knuckle of intestine for an extensive tear. The patient, fortunately recovered, however.

2. *Measures Required at the Time of Primary Rupture.* Unfortunately, the attention of the physician is more frequently directed to the occurrence

of primary rupture or abortion than to the existence of an ectopic gestation prior to this event. Too often efforts to arrive at a correct diagnosis may be the means of producing this catastrophe. Therefore, I would again emphasize the importance of delicate manipulation in a case of suspected ectopic gestation. Indeed, prior to the careful examination of a patient in whom an extra-uterine pregnancy is suspected it would be well to have ample provision for resort to immediate surgical procedure, in the event of collapse or rupture of the ectopic sac. Should the disaster occur during examination, or the physician be called upon to attend a case in which rupture had recently occurred, he should endeavor to keep the patient perfectly quiet and free from annoyance, with her clothing loosened. The foot of her bed should be elevated and a hypodermic injection of morphin should be administered not only to quiet the pain, but to lessen the nerve irritability and restlessness. An ice-bag should be applied over the abdomen, and immediate preparations made for opening the abdomen, in order to secure the bleeding vessel. The patient should be placed under the influence of an anesthetic. If the operator is at all in doubt whether the condition has resulted from an internal hemorrhage, he may confirm his suspicions by cleansing the vagina and making a puncture through the posterior fornix. This will permit recognition of the escaping blood. Indeed, through such a puncture the tubes may be examined and the presence of the sac recognized. Moreover, a skilful operator may be able to secure the bleeding vessels through the vaginal incision. Indeed, it has been advocated that the ruptured tube should be brought down, the surfaces cleansed, and sutures so introduced as to control the bleeding vessel and close the opening, leaving the tube in place. Such a plan of procedure is inadvisable, however. The fact that the caliber of the tube is so obstructed as to have caused an ectopic pregnancy would indicate that its retention must necessarily subject the patient to the danger of a recurrence. With the abdomen opened, the bleeding vessel secured, and aseptic precautions, no great effort need be made to free the peritoneal cavity of blood, for, if the patient is kept under proper regimen, the blood is quickly absorbed and serves in some degree to sustain and support her. The absolute indication at this stage is to arrest the hemorrhage, and this is most effectively accomplished through an abdominal incision. As soon as the abdominal incision is made there will be a gush of blood. The pelvis will be found more or less occupied with blood-clot. Do not stop to turn out the clots, but proceed through the clotted blood to the fundus of the uterus and along either tube to discover the sac. The site of the gestation is recognized as a soft, boggy enlargement of varying size and consistency, according to whether the ovum is, or is not, *in situ*. The sac is brought up and examined for the rent. When the hemorrhage is marked, the broad ligament is clamped at once with forceps, the sac cut away, the cavity cleansed and ligatures applied. If the patient is profoundly anemic, no time should be lost in attending to the toilet of the abdomen, but it should be irrigated simply with normal salt solution to carry away the principal clots.

The great majority of cases of ruptured ectopic gestation will recover without operation. The lowered vascular tension through the hemorrhage causes slowing of the current and favors the formation of a clot which plugs the vessel and arrests the bleeding. Experiments on dogs have shown that the ovarian arteries can be cut and left unligated and hemorrhage will be arrested without the death of the animal. Taking these facts as premises, it has been concluded that in cases of profound shock, it will be wiser to defer steps to arrest the hemorrhage radically until the patient has rallied from the shock. The second premise does not take into consideration the difference between the human and the dog in the coagulability of the blood. As to the first, all abdominal surgeons know that women do die when a ligature slips from an ovarian artery, and too many cases of deaths from ruptured ectopic gestation sacs have occurred to make him feel easy while such a patient is in peril. He has no assurance that the revival of powers of the patient will not result in driving out the clot with which the vessel has been closed, so that where the conditions are favorable, the interests of the patient seem best served by an immediate operation. The operator should do the operation expeditiously and it would be well to have a simultaneous intravenous injection of normal salt solution to fill up the vessels. Time should be taken to wash out thoroughly the larger clots from the peritoneal cavity. The fluid blood diluted with salt solution will serve to sustain the strength of the patient.

3. *Treatment of the Patient Subsequent to Rupture. a.* With intraperitoneal hemorrhage. The patient, having rallied from the shock, will in many cases recover without operative interference if she is kept perfectly quiet, promoting drainage through the intestinal canal by frequent purgation, and limiting the amount of food and drink that is given. She is thus obliged to live upon her tissues, which will promote the absorption of even a large collection. As we have already seen, the tube which has been the seat of an abortion generally will be found distended with clots, and the same material will fill up the retro-uterine pouch. The convalescence of the patient is usually shortened by the removal of the tube and the clotted blood. This is particularly true when the tube is the seat of a perforation from the villi, for frightful hemorrhage may be found, and under such conditions is likely to continue. Even when the hemorrhage arises as a result of rupture, we are not certain that the clot which plugs the vessels may not be loosened and a recurrence of bleeding follow. In spite of every precaution that may be observed it is not infrequently found that a collection of blood in the peritoneal cavity becomes infected from its proximity to the intestine, and thus a suppurative process is engendered which prolongs the patient's convalescence. Even this should not occur, if the blood-clot, becoming organized, causes thickening, extensive adhesions, and more or less crippling of the function of the pelvic organs for the remainder of the patient's life. If the patient comes under observation some days subsequent to the evident rupture, thus affording sufficient time for the vessels to become occluded by clots, having an accumulation of blood in the pelvis, which frequently is walled off by plastic exudate from the general peritoneal cavity, the preferable procedure would be to make a free incision into the vault of the vagina. Two

fingers then should be introduced through this opening, the clots broken up and evacuated, the cavity thoroughly irrigated with normal salt solution and packed with iodoform gauze. Frequently the tube may be brought down and secured by ligature or clamp between the seat of rupture and the uterus, and thus the mass be removed. This is particularly true when the tube is occupied by a large blood-clot. When the tube is situated high in the side of the pelvis or in the lower part of the abdomen, in a position not readily accessible through the vagina, the abdominal incision is to be preferred. It affords a better opportunity to inspect the condition of the pelvic organs, to remove the occluded tube, and, if necessary, the associated ovary. It has been urged that where one tube has been the seat of an ectopic gestation which has ruptured and led to operative interference, the other tube should be removed likewise in order to prevent the possible occurrence of an ectopic gestation within it. The many cases in which a normal intra-uterine pregnancy has followed a tubal pregnancy would render such a course unwise. While numerous cases are recorded in which an operation for the removal of an ectopic gestation has been followed by the occurrence of gestation in the remaining tube, this, however, is not the rule. It would be just as logical to forbid matrimony because an occasional marriage is unfortunate.

b. Extraperitoneal hemorrhage is a result of rupture of the tube between the folds of the broad ligament. A hematocele is thus produced which is situated in the cellular tissue between the layers of the peritoneum. The amount of hemorrhage is necessarily limited by the size of the vessel opened, the blood pressure, and the distensibility of the structure into which the hemorrhage has occurred. Where the collection is small, it may be sufficient to treat the patient expectantly, watch her progress, and trust to nature to absorb the exudate. Even so, it is possible, in rare cases, for the embryo to survive the accident and continue to grow. The continuation of the growth of the fetus presents additional and more serious problems. Prior to the fourth month the embryo, tube, ovary, and adjacent portion of the broad ligament, including the placenta, can generally be removed. Subsequent to this period, however, the placenta may have attained such a size as to render its removal difficult. Not infrequently the life of the patient is endangered by a subsequent rupture. The placenta extends upon the pelvic surface, covering over and surrounding the vessels and the ureter. Moreover, the intestines may aid in forming the sac wall of the developing embryo and a condition result which would render any operative interference exceedingly serious. Where the patient shows marked symptoms of internal hemorrhage and an examination reveals a collection of large size, an immediate operation is preferable, for the depressed condition of the patient increases the danger of infection of the effused blood from the walls of the adjacent intestine. When infection enters the sac, suppuration will follow. This, of course, greatly endangers the life of the patient. With such a collection, early interference is preferably made through the abdomen, for the reason that it affords a better opportunity for exposing and securing the bleeding vessel. Having opened the abdomen, the peritoneal cavity so far as possible should be carefully walled off with a large quantity of gauze, the blood-clots evacuated, and the bleeding vessels searched for and secured. If the blood collection has been a large one and the pelvis is covered with adherent blood-clot, an opening should be made into the vagina, through which should be carried the end of a piece of gauze sufficient to fill the cavity. When the collection has been extraperitoneal, the abdomen can be walled off with gauze before the broad ligament is opened, the clots should be turned out; the bleeding vessel secured; the cavity packed with gauze, the end of which has been carried through an opening in the vagina, thus allowing the peritoneal wound to be closed. Care must be exercised, however, in this procedure not to injure the uterine artery or the ureter.

4. *Method of Treatment Advisable in Advanced Growth of the Embryo.* a. The child alive. From the fourth month to the completion of pregnancy the existence of a quick placenta presents a condition which is generally regarded as the most dangerous in the whole realm of surgery. The sac has ruptured, the placenta has formed new and more extended attachments. While the condition of the patient cannot be considered otherwise than grave, the immediate danger is not so great but that we can afford to wait until a later stage of the pregnancy for interference and thus give the fetus a chance for its life.

The existence of the live placenta and the profound hemorrhage which results from any effort at its removal have led many operators to question the advisability of operative procedure while the child is alive. Some have advocated either to secure the death of the child by injecting into its body poisonous materials, such as morphine, or when near the completion of the pregnancy to await its death. They have justified this course of action by the assertion that in the great majority of cases the product of ectopic gestation is puny, ill developed, and often malformed—even when it survives extraction it usually lives but a few weeks, or at most months. Therefore they claim that the life of the mother should not be endangered to insure the life of a defective child. Experience, however, has disclosed that the extra-uterine fetus may be well developed, and when it is evident that the mother can be saved only by operative procedure, it seems cowardice that this should not be employed at a stage that will give the other being an opportunity for continued existence. Fortunately, the investigations of Dunning have demonstrated that the maternal chances are increased by operation during fetal life. The recognition of extra-uterine pregnancy, then, should lead to the preparation for operation at a certain definite time prior to the completion of the gestation, preferably at about eight and one-half months.

In resorting to operative procedures we must consider two points: 1. How to treat the sac; 2. How to dispose of the placenta. The sac is composed of remnants of the expanded tube or of the broad ligament, thickened and in parts expanded. In some places coils of intestine or the adherent omentum also enter into its formation. The removal of the sac, consequently, is fraught with danger, not only to the adjacent large blood-vessels and ureters, but to the abdominal viscera in general. When the pregnancy has passed the fifth month with ample evidence of a living child, I would advise that interference be postponed until after the eighth month. It should be undertaken, however, not later than at eight and one-half months, in order to afford the fetus the best chance for its life.

The operator is compelled to adapt his procedure to the condition immediately confronting him. The position of the fetus has been recognized and carefully outlined. In the majority of cases the median incision affords the best opportunity for the delivery of the fetus and the management of the sac and placenta. Having entered the peritoneal cavity, the sac is carefully examined and efforts made to avoid injuring the placenta. Where the sac is situated in front, we should endeavor to open it on one side. After opening the sac the most available part of the fetus is seized and delivered quickly. The cord is clamped with two hemostats and cut between them. The fetus is then removed and given to an assistant to be cared for. This preliminary discussion presents the question 1. *How to treat the sac*. The sac is composed of remnants of the distended tube or the broad ligament, thickened and expanded in parts. In other places coils of intestine or portions of the adherent omentum assist in forming it. The removal of the sac, consequently, is associated with great danger, not only to the adjacent large blood-vessels, but to the viscera and ureters. The ideal plan, where possible, is to follow the delivery of the fetus by the removal of the sac, including the placenta; where the removal of the sac cannot be safely accomplished, the operator should stitch its edges to the skin margins of the abdominal wound. In well-advanced pregnancy we may possibly be able to push the peritoneum from the anterior abdominal wall and to penetrate the sac without opening the peritoneal cavity, but the chief difficulty would be to determine then 2. *How to dispose of the placenta*, which will depend entirely upon its situation. Its management is most promising when situated in the pelvis below the fetus. When above the fetus, the placenta may be injured and result in furious bleeding or, indeed, death of the patient. Even prompt seizure and ligation of the uterine side of the sac may fail to arrest the bleeding. The abdominal aorta may then be compressed, the cavity packed with sponges, and an application made of perchlorid or persulphate of iron. The danger of bleeding has frequently induced surgeons to leave the placenta and allow it to slough away, employing proper measures for securing external drainage. When the removal of the placenta can be accomplished without too much risk, it should be done. In addition to avoiding the placenta in opening the fetal sac, we should exercise the precaution to prevent discharge of the amniotic contents into the peritoneal cavity. After delivery of the fetus the operation is completed in one of three ways:

3 a. Extirpation of the entire sac; b. Removal of the placenta without the sac; c. Retention of the placenta and sac.

a. *Extirpation of the Entire Sac.* Whenever it can be accomplished safely, the entire sac should be removed. As this operation is complete convalescence is surer. Removal can be accomplished when we can construct a pedicle and the sac wall is made of tissue that can be removed without disadvantage. The pedicle may be narrow or broad as in an ovarian cyst.

b. *Removal of the Placenta without the Sac.* The placenta should be removed whenever it can be separated without hemorrhage, or when it is so situated that the vessels supplying it can be ligated securely and the mass removed, or when its position is such that effective control of hemorrhage can be accomplished by tampons of iodoform gauze. After removal of the placenta the gauze may be removed and replaced by a large drain.

c. *Retention of the Placenta and Sac.* When the placenta is firmly attached or it is evident that its detachment would result in dangerous hemorrhage, it should not be disturbed. The operator should exercise the greatest care in the management of the live placenta, as hemorrhage in such cases is frightful and exceedingly difficult to control. Where the placenta is partially detached, it may be necessary to proceed with its removal. This should be accomplished quickly, making firm pressure over the parts with iodoform gauze. If the attachment is of a character to permit it, the parts should be quilted together by a ligature which is tied firmly around the base of the placenta. Where it is necessary to retain the placenta and the sac, one of the following methods can be practised: The sac can be fixed to the abdominal wall and the cavity drained; or the opening in the sac can be closed, covering over the placenta and shutting off the latter from the general peritoneum. The cord should be cut off close to the placenta, after previous ligation with chromic catgut, or its vessels can be closed by the electro-angiotribe. This instrument appeals to me as an efficient means of controlling hemorrhage and insuring the removal of a portion of the placenta. To accomplish this, it will require a modification of the angiotribes at present in use, employing one with a more flattened surface, thus allowing a good portion of the placenta to be subjected to the slow action of heat. The placenta and sac should be closed and returned to the peritoneal cavity only when we have been able to secure absolute and rigorous antisepsis. Microbic infection may lead to putrefaction of the placenta and suppuration. The disadvantages of the retention of the placenta are that its separation and discharge are tedious and present continuous risks of septicemia and peritonitis. Fecal fistula may form. These risks are decreased by irrigation of the sac, by the ligation of the cord close to the placenta without disturbing the latter, by carefully sponging the cavity, and then, as has been suggested, by hermetically closing it. Even though we are able to exclude germs from the cavity, it must be remembered there is danger of their entrance through adhesions to the intestines. Intestinal micro-organisms may gain access to the placenta and produce decomposition. The following rules have been formulated by Sutton:

When the placenta is situated above the fetus, attempt its removal.

If the placenta has become partially detached during the course of the operation, no choice is left but its removal.

The placenta below the fetus can be left.

If the placenta is left, the sac closed, and subsequently symptoms of suppuration occur, the wound must be laid open at once and the placenta removed.

b. The Fetus Dead, Mummified, or Reduced to a Lithopedion. The death of the fetus at any stage results in early arrest of the circulation in the placenta. The continuation of the growth of the placenta after the death of the embryo has been considered as a possibility, but this is very improbable. The placenta does not decompose, but undergoes slow and complete atrophy. The vessels in the maternal portion atrophy and disappear. This, consequently, leaves much less of the placental structure than would be found in an extra-uterine pregnancy. The absorption of the placenta continues until, in those cases in which the lithopedion is formed, the placenta is found to be entirely absent. Should the patient come under observation when the history would lead us to suspect that the fetus has but recently perished, it would be wise to postpone operation a few weeks later, when arrest of the circulation in the placenta may become complete. The sac is exposed by the abdominal incision, the general peritoneal cavity is well protected by gauze packing, and every care exercised to prevent the contents of the sac from soiling the peritoneum. This danger will be decreased greatly by drawing off the contents of the sac with an aspirator, and guarding the peritoneal cavity carefully with sponge packing before the sac is opened. The fetus is withdrawn and the sac examined then with a view to its removal, if possible. Where the condition will admit, the entire sac, with the enclosed placenta, should be removed. If knuckles of intestines are adherent to the sac, the greatest care should be exercised in their separation, in order to avoid inflicting injury to them. Where the adhesion is firm, the separation should be made at the expense of the sac wall, leaving a portion of it attached to the intestine. When a large portion of the intestine enters into the formation of the sac wall, the removal of the sac will not be feasible. In such cases the placenta should be peeled out, the cavity thoroughly sponged with carbolic acid and afterward with alcohol, dried, packed with gauze, and its edges stitched to the abdominal wound. Where the sac is dependent and in close approximation to Douglas' pouch, an opening should be made through its base into the vagina, through which drainage may be effected and the upper part of the sac closed. Vaginal drainage of the sac should be employed whenever possible, as the drainage is from the most dependent portion and the convalescence of the patient is much shorter and the dangers of subsequent ventral hernia greatly decreased. Following the death of the fetus marked changes occur. The fetus itself may become mummified, forming a flattened mass, when its watery portions are absorbed. The entire fetus undergoes a substitution of fat for its original structures, forming a lardaceous condition; or, the fetus and its sac undergo calcareous degeneration and forms a rather dense, hardened mass. Some of these conditions may continue for years. A lithopedion has been found in a woman of ninety. Its presence, however, always predisposes to infection, which may result in suppuration, with subsequent discharge of particles of the calcified mass. Wherever possible, the entire mass should be removed. After an abdominal incision, wherever it is recognized that the mass has formed extensive adhesions to the intestines and other structures of such character as to preclude the probability of successful removal, the sac should be opened, its contents removed so far as possible, the sac wall stitched closely to the abdominal wound, and its cavity packed with gauze. The removal of the fetus and the drainage of the sac result in its complete obliteration and the restoration of the patient to health.

c. Following Decomposition of the Fetus and Suppuration of the Sac. Decomposition of the fetus and suppuration of the sac are indicated by symptoms of inflammation, the sac becoming tender to pressure with evidence of localized peritonitis. The temperature of the patient will be elevated; possibly recurring chills, night-sweats, progressive emaciation, and symptoms of low continued fever will be manifest. Liquefaction of the sac by pus-formation causes thinning and even rupture of its walls, with the escape of its contents into the peritoneal cavity, the bladder, the intestine, the vagina, or through the abdominal walls. The rupture results in the formation of a sinus, through which fragments of small fetal bones often will be found passing. The existence of suppuration should be considered an indication for immediate operation.

To open the sac without entering the peritoneal cavity is, of course, more satisfactory, and occasionally this can be accomplished. If the adhesions between the peritoneal surfaces are not extensive, the opening may be a small one. The adhesions may be extended by gauze packing and other means. Where parietal adhesions do not occur, the sac should be opened and its contents thoroughly evacuated, but the peritoneal cavity must be thoroughly protected from soiling by gauze packing. Every fragment of bone should be removed, for otherwise the obliteration of the sac will not take place and suppuration will continue as long as the irritation remains. The cavity of the sac should be thoroughly packed with iodoform gauze and the sac itself be stitched to the skin edges. During the convalescence the cavity should be irrigated frequently with antiseptic fluids. Sometimes we may be able, especially where the opening has taken place through the abdominal wall, to dilate the sinus and empty the sac without opening into the general peritoneal cavity. This method of procedure can be used effectually in the opening through the abdominal wall and the vagina, but openings into the bladder or intestine will require abdominal operation. However, efforts should be made to remove the sac, if possible, and to close the intestinal or vesical openings.

GENITAL TUMORS.

276. Genital Tumors. In the broad sense of the term any unusual swelling or protuberance of a part can be called a tumor, but the designation is properly restricted to a new-growth which is neither produced by inflammation nor productive of it. Such a growth is distinctly circumscribed, has a marked course, can be definitely differentiated, and is associated with febrile symptoms only when degenerative changes exist.

Classification. Tumors of the genitalia, like those occurring in other portions of the body, are divided clinically into the benign and malignant; pathologically into neoplasms and cysts, and histologically into those which originate in adult or in embryonic tissues. The following table, prepared for me by Dr. P. B. Bland, presents the subject in a readily comprehensive form:

- Benign
  - Solid
    - Adult connective tissue
      - Fibroma
      - Myoma
      - Fibromyoma
      - Fibro-adenoma
      - Angioma
      - Lipoma
      - Myxoma
      - Chondroma
      - Osteoma
    - Adult epithelial tissue
      - Neuroma
      - Papilloma
      - Adenoma
  - Cystic
    - Retention
    - Glandular
    - Papillary
    - Congenital
      - Dermoid
      - Teratoma
      - Parovarian
      - Vaginal cysts
- Malignant
  - Histologic
    - Embryonic epithelial tissue.
      - Carcinoma
      - Chorio-epithelioma malignum
    - Embryonic connective tissue
      - Sarcoma
      - Endothelioma

When we come to analyze the arrangement of these growths into groups, we find that any arrangement must be more or less arbitrary. The transition from one form to another is so subtle as to make the classification of some growths very difficult and uncertain. The definition into benign and malignant is of classic origin and necessarily of great importance. A benign tumor may be defined as one which in the course of its development inclines to remain local or confined to the structures in which it originated. It develops from adult tissue, is not usually destructive to life in its progress, and displays no disposition to metastasis nor to recur when removed. The malignant tumor, on the contrary, is supposed to have its nidus in embryonic tissue, gradually breaks down its original barriers, invades the surrounding structures, extends by metastasis until the entire organism may become infected, and displays a marked tendency to recur after surgical intervention.

The study of the structure of growths shows a marked difference in the cellular tissue of the two classes, each having well-defined tissue changes which render them recognizable, and from which the future progress may be predicated.

In the differential diagnosis it is often difficult to draw the line and assert that the benign terminates here and the malignant begins there. In some of the uterine and ovarian growths, particularly the glandular varieties, we are forced to rely upon the life history of the growth in order to determine its proper classification. Notable examples are the glandular and malignant adenomata of the uterus and the papillomata of the ovary.

277. Characteristics of Benign Neoplasms. The benign growths have been divided into solid and cystic, and the former, from their structure, into the connective-tissue and the epithelial tumors. The connective-tissue growths predominate among the benign, and while they may be found in all the tissues of the genitalia, they characterize to the greatest degree those springing from the uterine parenchyma. They are known as the myomata or fibromyomata, according as the muscular or connective tissue predominates, or the fibromyomata in a combination of the two. Cystic tumors are those which consist of the envelope, sheath, or sac containing thin serum, blood, pus, mucin, sebaceous material, parasites, hair, cartilage, or bone. These tumors have their origin in the ovaries, broad ligaments, vulva, and vagina, in congenital remains, as the Wolffian bodies, the parovarian and remnants of the ducts of Gärtner, and the Müllerian ducts.

Cystic growths of the ovary present considerable difficulty in classification, inasmuch as twenty per cent. of them prove to be malignant. Even careful microscopic examination of the growth will not always aid proper classification, because a malignant nodule or portion may be engrafted upon what otherwise seems a benign growth, and may be so situated as to escape observation, for the examiner would be entirely unable to subject the parts of a large growth to such an investigation. Certain of these growths—the papillomatous variety—show a disposition to grow through the enveloping sheath or cyst wall, and when it is ruptured, their contents even infect or become implanted upon the peritoneal surface, causing a low grade of peritonitis and an extensive ascites. Such behavior at once answers to the description of malignant disease, but experience demonstrates that in the majority of cases the removal of the original source of infection, the ovarian growth, produces atrophy and disappearance of the secondary infection of the peritoneum. In many of these growths the surgeon is compelled to determine the final diagnosis between benignancy and malignancy by the subsequent clinical history of the patient. In discussing specific growths, comparison can be made more readily by considering separately the tumors, benign or malignant, which are prone to occur in each portion of the tract.

In the former editions I discussed some conditions under genital tumors, using the term in its unrestricted sense, which I will now consider separately. These conditions are hernia, hydrocele, varicose veins of the vulva, edema, elephantiasis, and urethral caruncle.

278. Hernias. The gaseous cysts are hernias which present in the vulva two varieties—the anterior labial or inguinal, and the posterior labial. The anterior labial hernia is analogous to the scrotal hernia in the male. It is formed by a portion of intestine or omentum descending through the inguinal canal and distending the large labium. (Fig. 462.) This form of hernia is comparatively rare in women. Femoral hernia is much more frequent in the female. In the latter the hernial sac emerges below Poupart's ligament and makes its exit as a lump in the groin, which, as it increases in size, pushes up over the ligament. In the sac of an inguinal hernia has been found an ovary and tube and even the fundus of the uterus. Instances have been recorded of an ovarian cyst or a tubal gestation complicating such a hernia. The posterior labial hernia (Fig. 463) is formed by the intestine driving the peritoneum through the pelvic aponeurosis and the levator ani muscle. The sac appears at the side of or projects through the vulvar orifice. Labial hernia may sometimes be difficult to differentiate from hydrocele or a fatty tumor of the labium. A double hernia with an ovary in each labium associated with a large penis-like clitoris may cause some doubt as to the sex of the individual.

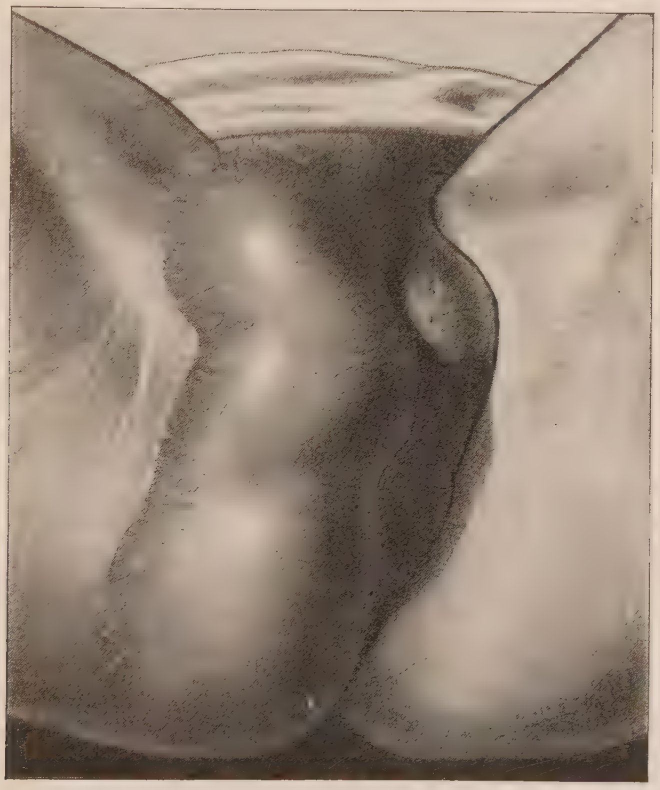


FIG. 462.—Anterior Labial or Inguinal Hernia.

279. Hydrocele. A well-formed serous cyst which is continuous with the peritoneal cavity is sometimes situated in either labium majus, or when the canal of Nuck is patulous it may, by slight pressure, be emptied back into the peritoneal cavity to recur as soon as the patient assumes the upright. This tumor is known as hydrocele, and is analogous to the serous collection sometimes found in the scrotum of the male. The sac is thin walled, quite translucent, and affords a distinct sense of fluctuation. The swelling gradually increases in size and may become so large that it is uncomfortable in sitting or walking, and may prove an obstacle to the sexual relation. Hydrocele is readily distinguished from solid tumors by its translucency and distinct fluctuation; from hernia by its being more continuously distended, except in the few cases in which the canal of Nuck remains patulous, the more distinct sense of fluctuation, its translucency, a less amount of pain or discomfort, the absence of any swelling over the line of the inguinal canal, and the failure of the protrusion to increase during coughing or straining.

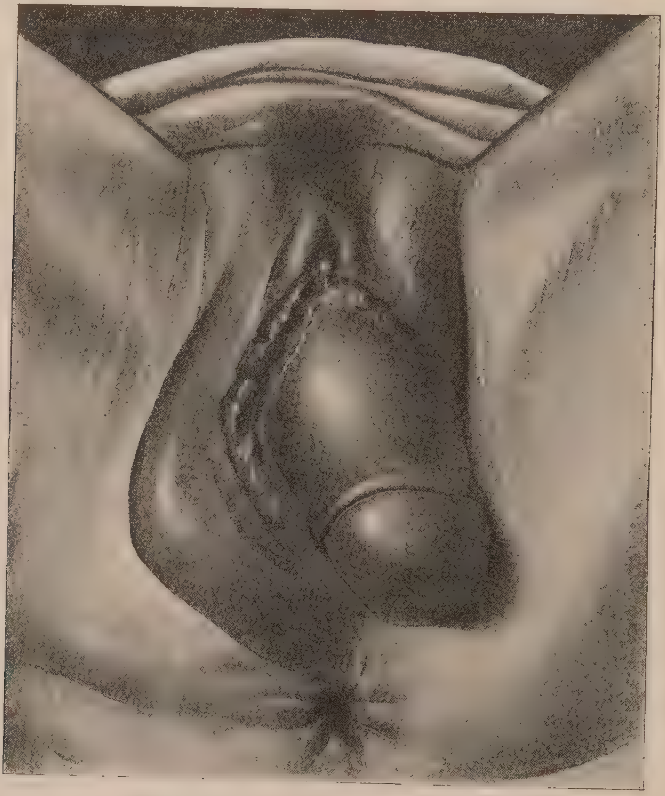


FIG. 463.—Posterior Labial Hernia.

Treatment. The contents can be removed readily by puncture, but recollect rapidly. Obliterative inflammation may be engendered after the removal of the fluid by the injection of some irritating agent, and pressing it about to bring it in contact with the entire cavity of the sac, but care must be exercised to prevent its being forced through an open canal into the peritoneal cavity. A safer and more satisfactory procedure will be to make a free opening into the sac and pack it with iodoform gauze.

280. Urethral Growths. Erectile or vascular tumors are rare in the labium, but when they occur, present characteristics similar to those in other portions of the body. Vascular growths about the urethra are much more frequent.

Pozzi states that the hymen is not a simple isolated structure surrounding the vulva, but comprises, first, the masculine frænum vestibuli; second, the ring inclosing the urinary meatus; and, third, the hymen. The structure is the undeveloped matrix tissue of the corpus spongiosum in the male, and has not become erectile. These considerations, he asserts, throw light upon the origin of some of the vascular growths of the urethra and meatus. The retention of the erectile tissue in the female, which is normal in the male, results, through efforts at micturition, in the formation and extrusion of a polypus, known as a urethral caruncle.

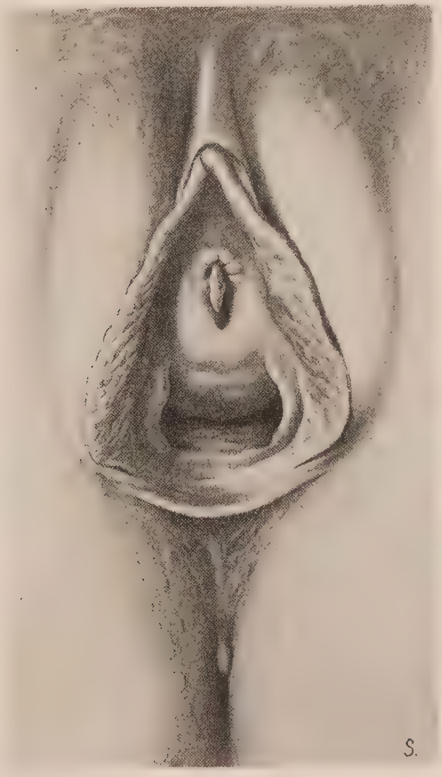


FIG. 464.—Urethral Caruncle.

A urethral caruncle appears as a bright red, fragile looking projection from the urethral orifice. It is largely composed of dilated capillaries with a small amount of connective tissue, and is covered with pavement epithelium. Microscopic sections of these growths have revealed the presence of well-marked glandular structures. The growth is amply supplied with nerves, which are more or less exposed. The structure of the growth accounts for its vascularity and great sensitiveness. (Fig. 464).

Etiology. Caruncle may occur at any age. Often seen in young children, it is more frequent in middle life, and has been found in women as late as the seventy-fifth year. It occurs with equal frequency in the married or the unmarried.

Symptoms. The growth usually projects from the meatus and generally is situated on the posterior urethral wall. When the vulva is separated widely, the tumor is pushed forward and rendered more prominent. Its sensitiveness varies in different individuals. In some it produces no marked symptoms, while others complain of continuous burning, a sensation of fullness in the urethra, and marked pain during and for several minutes following urination. Occasionally the distress is so marked that the act of micturition is prevented and the employment of a catheter is rendered necessary. As extreme sensitiveness frequently causes it to be a barrier to the sexual relation, it is one of the causes of dyspareunia.

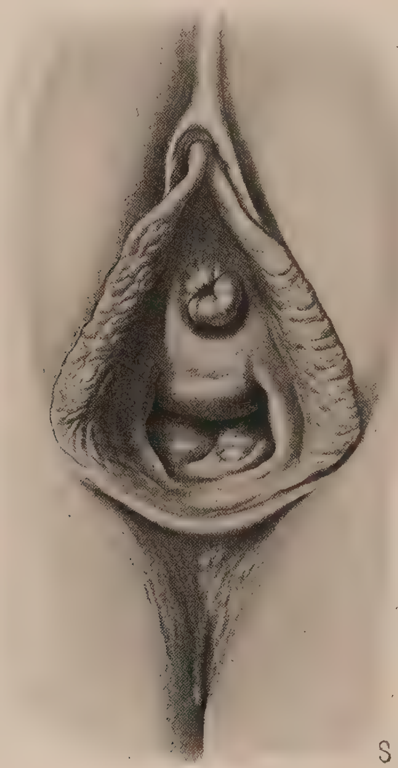


Fig. 465.—Prolapsus Urethræ.

Diagnosis. The tumor is readily recognized by its bright red appearance, extreme sensitiveness, and fragility. A varicose condition of the urethral vessels may occur, but this is characterized by bluish projections from the urethral orifice, which are plainly recognized as distended veins, somewhat resembling hemorrhoids about the anus. A prolapse of the urethra may exist, but this condition forms a rounded projection which partly or completely encircles the urethral orifice. (Fig. 465.)

Treatment. The only treatment that affords any hope of success is excision. This may be done under cocain anesthesia. The mass is picked up and cut off at its base with scissors, and bleeding arrested by coaptating the surfaces with a suture. It is more satisfactorily accomplished, however, under general anesthesia, as the patient is then quiet and the manipulation can be more deliberate. The excision of the mass with scissors and the application of the thermocautery to the base are very efficient. In the employment of the thermocautery a wooden rod the size of a catheter should be introduced previously to preserve the urethra from destruction. Especial care must be exercised to control the hemorrhage, as I have seen frightful bleeding occur from such an operation.

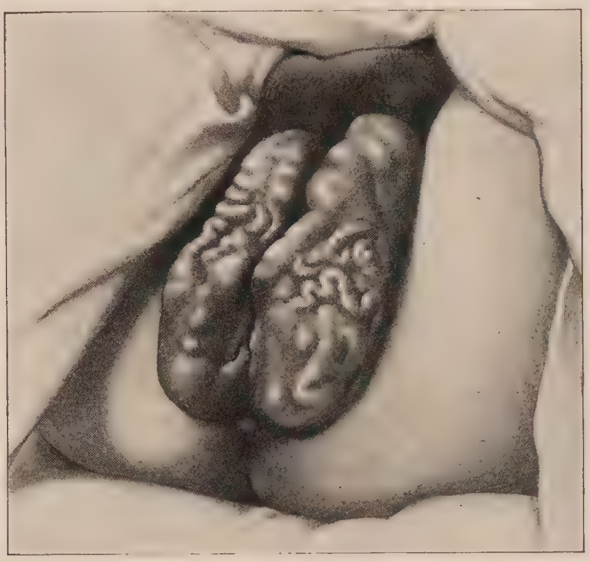


FIG. 466.—Varicose Veins of the Vulva. (*Dr. W. Krusen.*)

281. Varicose veins of the vulva are not infrequent during gestation. (Fig. 466.) Holden reports a case in which the labia majora were the size of a fetal head. The patient died of phlebitis. The tumor presents a bluish color on the surface of the integument, violet on the mucous surface, and causes a sensation of weight in walking or when the patient is upright. The rupture of such a tumor may cause serious or even fatal hemorrhage. The patient should be cautioned to wear loose clothing, with no constriction about the waist. The varicose parts should be supported. The most effective treatment is excision of the principal veins.

282. Edema. Anasarca is frequently accompanied by extensive swelling of the labia. The cause is readily recognized by the associated condition. When edema exists without general dropsy, it is indicative of some obstruction to the circulation in the pelvis. Edema confined to one labium is generally the result of injury or inflammation. A hard, dense exudation in one labium will usually be found to be due to a hard chancre, situated upon the same side at the margin of the vagina.

283. Elephantiasis consists in chronic inflammation of the lymphatics, with dilatation of their canals. It is very rare in our climate, but is more likely to exist in hot climates. The cause of the condition is unknown. The affection consists of more or less considerable hypertrophy of the entire vulva, sometimes localized in certain regions, as, for example, in the clitoris. The large hypertrophied labia form voluminous masses, which may exceed the dimensions of an adult head. (Fig. 468.)

Three forms are described: 1. the entire derma is hypertrophied, with vast dilatation of the lymph-spaces; 2. the engorgement of the lymph in the capillaries and large trunks; 3. the lymphatic ganglia become the seat of fibrous alteration.

Symptoms. The enlargement is frequently so great that walking and urination are interfered with. Friction of the surface leads to ulceration, which is slow to heal. The thickened tissues invade the vulva and the perineal and anal regions, and form enormous tumors. When the surface of the skin is smooth, it is called glabrous; when roughened, with warty projections, verrucous; and papillomatous when the papillæ are much hypertrophied.

Diagnosis is easy. The hypertrophy and swelling of lupus are always accompanied by ulceration. The papillomatous vegetations are situated directly on the skin. In fibromata and myxomata which become pedunculated the tumors are isolated and circumscribed, while elephantiasis is diffuse. The cause of the condition is unknown, although it has been attributed to syphilis. It is due to an acute lymphangitis, with intense fever. The only effectual treatment is ablation and the suturing of the surface in order to secure union by first intention.

THE VULVA.

284. Tumors of the vulva are comparatively rare and comprise cystic and solid, benign and malignant, growths.

285. Cysts. *Serous cysts* would naturally be expected to occur in a region so well provided with glands as is the vulva. Retention cysts of the gland of Bartholin belong to this class. (See Bartholinitis sec. 234.)

Sebaceous cysts rarely attain to any size. They are found upon the labia majora, the labia minora, in the sulcus between them, about the clitoris, over the mons veneris, and sometimes upon the edge of the hymen.

Blood cysts are occasionally found. These may originate in a preëxisting hematoma, through a hollow, round ligament (Koppe), in the sac of an old hernia, in the site of a thrombus, or from dilatation of lymph-vessels.

Cysts are also found in the hymen –Döderlein says, from fusion of adjoining surfaces; in the urethra, either from obliteration of Skene's glandules or the dilatation of a terminal and unobliterated vestige of Gärtner's duct.

Hematoma of the vulva and vagina has been described. (Sec. 271.)

Abscess. (Sec. 234.)

Neuroma of the vulva is a rare condition. Painful nodules are occasionally recognized, and their presence occasions vaginismus.

Treatment would be to excise painful spots.

286. Simple Vegetations. Vegetations appear upon the vulva in the form of papillomata or condylomata, occasionally having the appearance of a cauliflower. They may be situated at the edge of the vulva in isolated projections, or may cover, by a voluminous growth, the whole surface of the external genitalia. The mass may extend backward around the anus, and may attain the size of a fetal head. The vegetations present a pale red color, often a deep wine tint, and are situated upon the vulva, perineum, and margin of the anus, sometimes extending forward over the mons veneris and over the inner surface of the thighs. (Fig. 467.) A profuse leukorrheal discharge is generally present, which is retained by these vegetations, and causes an extremely disagreeable and fetid odor. The decomposing discharges irritate the surface, which becomes greatly inflamed during walking and exercise. They are generally considered an indication of venereal infection, and are produced by either gonorrheal or syphilitic virus. (Fig. 468.) Transmission of the disease by contact has been observed. The presence of vegetations, however, is not always an indication of specific infection, as these growths arise in pregnant women from a simple leukorrhea. The surfaces upon which they are implanted may become thickened by inflammation, undergo ulceration, and be covered by a glairy, fetid mucus which increases the resemblance to malignant disease. A vertical microscopic section of a growth, however, will reveal its true character. In the vegetations are dilated, treelike capillaries embedded in connective tissue, and covered with several layers of epithelium, thus presenting a marked contrast to the nests or tubular masses of epithelium embedded in connective-tissue stroma, which indicate the presence of epithelioma.

Treatment. Keep the parts thoroughly clean, irrigate with bichlorid solution (1 : 2000), and dust the surface with equal parts of alum and sugar or paint it with carbolic acid and afterward wash with alcohol. When the vegetations are very extensive, the most effective method of treatment is to place the patient under an anesthetic and cut away the vegetations with scissors, cauterize the base with nitric or chromic acid, or, still better, with the thermocautery, and subsequently keep the parts clean and dusted with a drying powder. Convalescence will be rapid. The existence of pregnancy need be no barrier to the method of treatment indicated, as the danger to the patient from sepsis following delivery is much greater than any which could result from removal of the growths.

General anesthesia can be avoided by saturating the parts with a 10 per cent. solution of cocain. Removal of the growths by the curet has been advised, but the scissors affords a cleaner and more effective instrument. Excision produces less irritation of the subjacent skin. The hemorrhage may be controlled by the application of a strong solution of persulphate of iron, but the thermocautery will prove more satisfactory. The burning of the latter can be lessened by painting the surface with

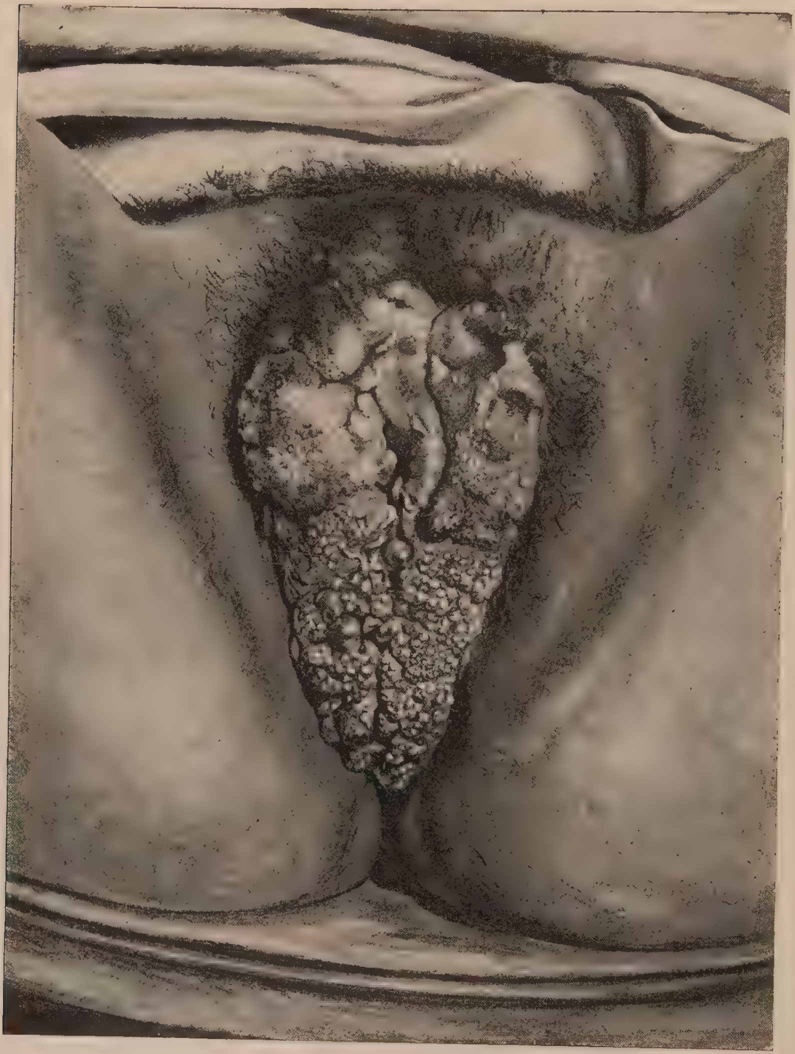


FIG. 467.—Vulvar Vegetations.

carbolic acid or better still by the application of a compress wet with a 5 per cent. solution of carbolic acid. The application of a 10 to 40 per cent. solution of formaldehyd two or three times will cause the vegetations to slough, but this is a painful application.

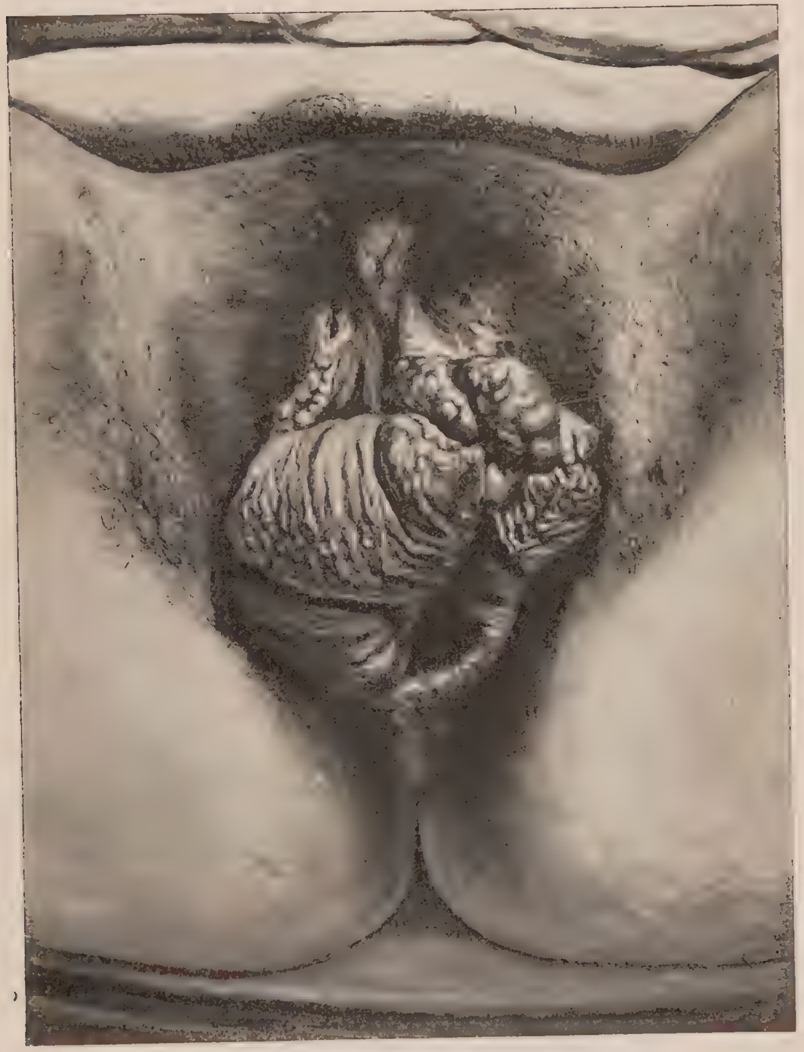


Fig. 469.—Elephantiasis of the Vulva.

287. **Fibroma and myxoma** are tumors which are found in the large labia, though they may also develop in the nymphæ or in the perineum. They are benign tumors of slow growth, though they occasionally attain to large size. The former become pedunculated. The tumor may be enucleated or the pedicle may be cut without danger of hemorrhage.

Fig. 470 shows a fibroid tumor that occurred in the practice of Dr. S. E. Cox, of Nashville, to whom I am indebted for the illustration.

288. **A lipoma** is a fatty tumor of the labium which may resemble elephantiasis. Through the kindness of Dr. E. L. Reed, of Atlantic City, I was permitted to remove a lipoma the size of an orange from the vulva of a woman who consulted him because she feared it was a hernia. Lipomata are usually small, but Stiegel removed one that weighed ten pounds.

289. **An enchondroma** is an exceedingly rare cartilaginous tumor which affects the clitoris. It may become as large as the fist and present calcified portions. Bartholin reports a Venetian courtesan who wounded her paramour with her ossified clitoris.

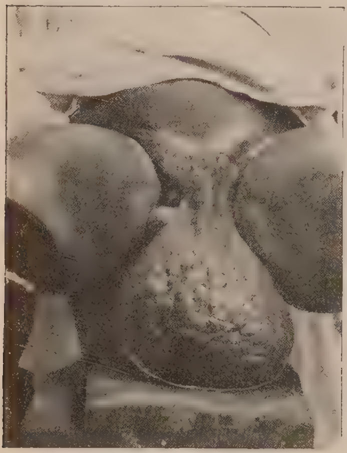


FIG. 470.—Fibroid of Labium.

290. **Malignant Disease of the Vulva.** Malignant disease occurs in the vulva in the form of epithelioma, sarcoma, and in rare cases as adenocarcinoma. Primary cancer of the vulva is rare. Epithelioma is the most frequent form and begins in the large labium or in the cleft between it and the lesser labium, less frequently in the clitoris or the meatus. The disease originates from the squamous epithelium and usually appears first as small warty nodules covered with thick layers of epithelium. Sometimes it follows irritation about the base of a preëxisting papilloma or wart. It is frequently preceded by psoriasis. The epithelium covering the nodules undergoes degenerative changes and causes a discharge of thin watery fluid mixed with blood. Groups of the embryonic cells fracture the limiting membrane and penetrate deeper tissues, supplanting the normal tissue and forming the characteristic epithelial pearls. Sometimes the cells will be found in the act of penetrating the walls of the blood-vessels, thus expediting the propagation of the disease. As the infiltration advances, superficial ulcerations occur, which gradually become deeper and involve the neighboring structures. (Fig. 471.) The superficial inguinal glands are the first to become infiltrated with the malignant cells. The disease occurs upon one side and then spreads to the opposite, possibly by inoculation through apposition. Adenocarcinoma results when the disease begins in the glands of Bartholin.

Sarcoma occurs in the simple form as melanosarcoma.

Symptoms. The patient suffers from intense pruritus, in scratching for which the nodules, previously unnoticed, are discovered. These become excoriated and cause a bloody discharge and an exceedingly fetid odor; not infrequently the nodule is a wart which has become irritated at its base and subsequently infiltrated. The nodules may be sessile or pedunculated, and subsequently coalesce. When the disease occurs about the urethra, the orifice may become contracted, and the canal may appear as a hard, indurated cylinder. The ulceration presents excavated borders, with the adjacent skin infiltrated and hard, and the pubic hair may fall out. In the later stages the skin and tissues for some distance around the vulva become indurated and hard, and the glands of the groin are infected. With the extensive inflammation, the discharge, loss of blood, loss of rest, and the mental anxiety cause emaciation, and death follows from marasmus, sepsis, or metastatic development. The latent period is a long one, the disease remaining for some length of time with but slight circumjacent or more extensive involvement. Death occurs in the second or third year.

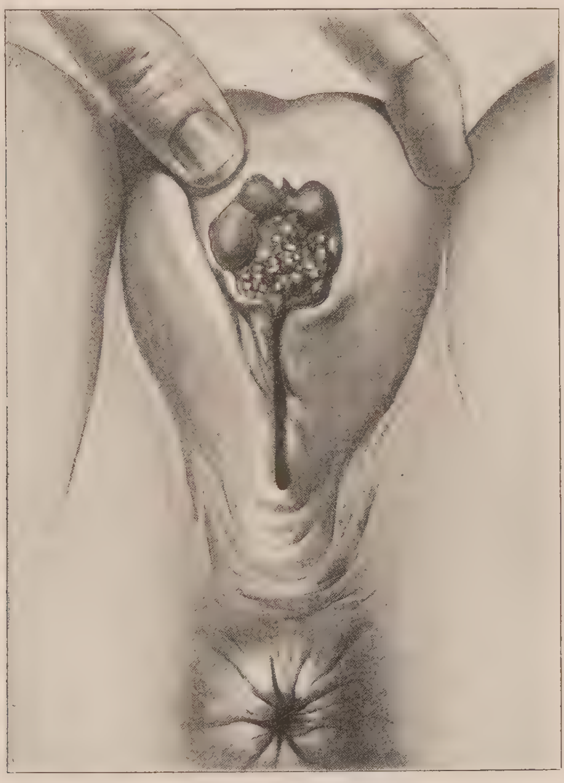


FIG. 471.—Cancer of the Vulva.

Diagnosis. The history of continued genital psoriasis; intense pruritus, with small nodules; arrangement of the epithelial layer, which shows a tendency to break down; the irregular ulceration, with infiltrated base and margins; and, later, glandular involvement, are sufficient to indicate the character. Papillary vegetations extend over a considerable surface, are comparatively free from induration, and in no sense resemble cancer. A polypus or caruncle of the urethra has a base free from induration. Chancre is an indurated sore without disposition to spread, and is associated with glandular involvement, and later with syphilitic eruption. Chancroid is a superficial ulceration without induration. The contiguous surfaces readily become inoculated. The lymphatic glands promptly go on to suppuration and to the formation of buboes. In lupus the ulceration is serpiginous, with a tendency to cicatrization in the tissues first affected, and glandular involvement is rare.

The prognosis of malignant disease of the vulva is bad. The cases usually come under observation after extensive involvement, generally after the lymphatic system has become invaded by the malignant process. Operative treatment delays the progress of the disease and renders the patient more comfortable.

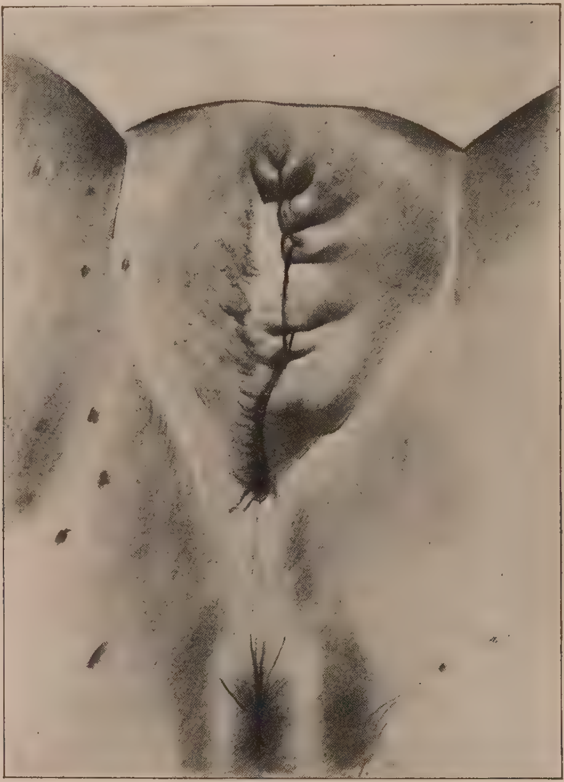


FIG. 472.—Appearance of the Vulva after an Operation for Cancer of the Vulva.

Treatment. The only hope for the patient consists in total removal of the disease. Some prefer the thermocautery or galvanocautery to the knife, as affording less danger from secondary inoculation. The scissors or the knife, however, are preferable, as by their use we shorten the convalescence and leave the structures less distorted. Care must be exercised, when possible, not to injure the meatus. In peri-urethral cancer, however, the sound should be introduced into the bladder, which will aid in the dissection, and the neoplasm, if necessary, should be followed to the vesical neck. In one case I removed the urethra to its internal meatus without the patient suffering from incontinence. The incision should extend well around the disease, as far as possible within the bounds of healthy tissues. Bleeding vessels, rather frequent in this region, are secured with clamp forceps, and ligated if necessary with catgut ligature, or the sutures closing the wound are so introduced as to constrict the bleeding vessels. Care must be exercised that the bleeding vessel does not retract and continue to bleed. In one of my early operations for this condition this retraction of branches of the internal pudic caused hemorrhage which followed the pelvic muscles backward, broke through and formed a large hematoma upon the posterior surface of the sacrum. In such a case, if the vessel cannot be secured otherwise, it will be better to tie the internal pudic on the external surface of the spine of the ischium. Fig. 471 illustrates the case of a woman who underwent operation in which both labia and clitoris were removed, and the tissue subsequently united, as seen in Fig. 472. Any inguinal glands involved should be extirpated, as well as the principal chain of lymphatic vessels leading to them. The circumjacent fat and cellular tissue should also be removed. When the disease has progressed too far to render radical operation successful, the putrid discharge may be temporarily controlled by the use of the curet and cautery. When the disease is too far advanced for this, the surfaces may be kept sprinkled with iodoform and pure charcoal, and dressed with gauze. The surface can be dusted with the following powder:

℞.	Salicylic acid,....................................	gr. iv
	Boric acid,...	℥j
	Iodoform,..	ʒij
	Ext. eucalyptus,................................	q. s.

Kraske advises in extensive disease that the parts be thoroughly cureted, the lacerated parts cleansed, and the surface covered with flaps of healthy skin, as this procedure renders the course of the disease slower and the symptoms less painful.

THE BLADDER.

291. Tumors of the Bladder. Neoplasms occur in the female bladder in 9.8 per cent. as compared with their frequency in that of the male. The classification of Küster, based on the histological structure, is the most generally accepted as follows:

1. Epithelial group.	Papilloma.
	Carcinoma.
	Adenoma.
	Cysts.
2. Connective-tissue group.	Sarcoma.
	Myxoma.
	Fibroma.
	Angioma.
3. Muscle group.	Myoma.

292. **The Papilloma** is a pedunculated growth of branching connective-tissue stalk which contains the blood-vessels and occasionally muscle structure. Its surface is covered with one or more layers of epithelium, but without any infiltration of the bladder-wall at its base. It presents two types, the villous and the lobulated. The former may be very extensive, filling the bladder with great branching growths resembling a cluster of grapes. These growths originate in the mucosa and the submucosa. As they float in the distended bladder they resemble a great water plant. They absorb water and consequently are shrivelled up when kept in alcohol. They are most frequently found on the base of the bladder, though they may occur on the fundus. Their growth is slow and they are said to manifest a disposition to recur when removed, but this may be the result of growths which were overlooked when the original tumors where excised. They are distinguished from papillary carcinoma by the absence of any cell-nesting and alveoli in their structure and especially by the want of infiltration in the bladder-wall at the base of the growth.

They are manifested by blood with the urine, although this may be an inconstant symptom and occur only at intervals. Urination may be frequent because the tumor so fills the bladder as to leave scant room for the accumulation of urine or the flow may be impeded or arrested by the branches of the growth floating into and obstructing the urethra. In some cases they may project from the urethra.

293. **Carcinoma.** The commonest form of cancer of the bladder is the papillary and is consequently mistaken for the simple papilloma. This confusion is doubtless the foundation for the assertion that the benign growth often terminates in the malignant. Cancer occurs in the bladder mainly between the ages of fifty and sixty years, but has been seen as early as twenty-five years. The papillary growths present under the microscope the cell-nests and alveolar structure characteristic of cancer with more or less infiltration of the bladder-wall at the base of the growth. Consequently the tumor is more palpable than the ordinary papillary growth. In rarer instances, cancer appears as a hardening of the bladder-wall with proliferation of epithelium, and later destructive ulceration. The infiltration of the bladder-wall, however, is unlikely to be general. While the disease may be found on the fundus or any other part of the viscus it occurs with greater frequency on the base. Its situation in this region leads early to pressure on the ureters developing obstruction to the flow and causing hydronephrosis. The changes in the urine from the accumulation of desquamated and decomposing tissue favors the early development of pyelitis and pyelonephritis.

294. **Adenoma** is comparatively rare because of the infrequency of glandular tissue in the female bladder. However, it may occur and fill the entire bladder.

Cysts of the bladder are not common.

295. **Sarcoma.** Of the connective-tissue group, sarcoma occurs with the greatest frequency. It may become manifest at any age, though in contrast with cancer it is more apt to be early.

296. Myoma. The tumors are hard, whitish on the cut surface and arise from the vesicular muscular structure. They may remain sessile or become pedunculated. The more thinned the pedicle the less the vitality of the tumor until it is partially destroyed.

Symptoms arising from neoplasms of the bladder will depend on their character. Small myomata and the papillary growths when small cause no symptoms. The most characteristic symptom of the presence of a growth will be hemorrhage which may seem to come on without any warning. Often it will occur at night and the patient will insist that the blood comes from the vagina. After a bleeding the urine may become clear and there will be no return for days or weeks. After the tumor exists for some time the bleeding may be more continuous or recur with greater frequency. Malignant growths and the large papillary growths are particularly prone to bleed. In cases of hemorrhage care must be exercised in the use of the catheter as such tumors are often situated on the base of the bladder and may be injured by its insertion; or fragments of the papillary variety may float into the eye of the instrument and be pulled off as it is withdrawn, thus aggravating the hemorrhage. Masses, removed in this manner should be examined carefully. Papillary tumors situated on the trigonum are apt to float into the urethra and obstruct the flow of urine. When the growths have existed for a long period the urine becomes progressively bloody, coffee-like, or brownish. The tumor surface is black, red, often opaque, or a bright red. The urination is frequent, occasionally painful and associated with tenesmus as a result of the accompanying cystitis. Sometimes the patient will suffer from retention of urine as a result of the situation of the tumor which permits it to act as a valve closing the internal urethral orifice. The growth as a result of pressure or extension in malignant conditions may obstruct the passage of urine from one or both ureters. Pain and a sense of fulness is then experienced in the region of the kidneys and the obstruction is marked; uremic symptoms may follow. The protracted hemorrhage and the loss of rest and continued discomfort produce a marked anemia—even cachexia. Notwithstanding the distress the condition may continue for a period of years. In cancer, the urine smells like carrion and is mixed with blood-cells, pus, and débris of the disintegrating tissues, the evacuation of which, aggravates the tenesmus and the distress. The patient has an elevated temperature, rapid pulse, an anxious expression and the appearance of suffering from some grave condition. Cystitis develops early and the patient has but little comfort day or night. The invasion of the bladder walls, renders them rigid and so fixed that the capacity for accumulation becomes greatly limited. Extension to the peritoneum increases the distress and involvement of the ureters leads to their dilatation—frequently to hydronephrosis.

Carcinoma of the bladder is oftener the result of secondary invasion from the uterus, vagina, rectum, or ovary.

When it is invaded from the uterus or vagina, the bladder walls often break down and a fistula results, making the condition of the patient almost unbearable to herself and those who are obliged to attend her because of the stench of the urine and decomposing structures.

Diagnosis. Examination is practised by palpation with two fingers of one hand in the vagina, while the fingers of the other are placed over the abdomen. The patient lies upon a table or hard couch. If the bladder is emptied with a catheter, the greatest care must be taken and the possibility of hemorrhage produced by injury, remembered. The examination is made slowly, carefully, and systematically. Generally, the abdominal walls are easily depressed. When the patient is unable to relax them, an anesthetic should be given. By careful investigation a tumor as small as a hazel-nut can be recognized, but pedunculated growths easily may be displaced to one side and elude the grasp, leaving one in doubt as to their presence. The ovaries are not unusually so situated that they may be felt, and lead to the belief that a vesical tumor is present. Diagnosis should not be based alone upon palpation. The urine should be examined chemically and microscopically. Cylinder-like cells are characteristic of papilloma. The older writers placed great stress upon the character of the hemorrhage—whether fluid blood, worm-like clots from the ureters, blood only, in the first or last portion of urine, or pure blood following catheterization. These distinctions afforded differential diagnosis between renal and vesical hemorrhage, but are now considered of little value as compared with cystoscopy. By direct investigation with the electric cystoscope the relation of the tumor to the vesical wall, its size, structure and character can be determined. The investigation can be made with the bladder filled with air or water. In bleeding, the latter is not so satisfactory unless the precaution has been taken to irrigate the bladder, preferably with hot water. When the kidney is the seat of the hemorrhage bloody urine can be seen flowing from the orifice of the ureter. The bladder can also be investigated by touch with a finger introduced through the urethra, but this should be practised with the greatest prudence, and, preferably, with the little finger only, because overdilatation may result in incontinence.

Treatment. The only treatment for vesical tumors is operative. Following the diagnosis, the operative procedure should be employed as soon as the condition of the patient will permit. High fever, suppuration, cystitis, and marked anemia are considered as contra-indications.

The removal of the growth is surprisingly easy. New loss of blood is endangered by every day's delay. Suppuration is not a contra-indication. In large tumors irrigation does not secure disinfection, and suppuration ceases only after the complete removal of the mass when the danger of nephritis is lessened.

Access to the tumors may be secured through the urethra by the urethral speculum. Masses are seized with forceps and torn off, cut through by the galvanocaustic loop, cut away with scissors or forceps, or scraped off with a sharp curet. The last, however, should be used only when the finger can be introduced as a guide. The urethral operation cannot be thorough. In malignant conditions, even should the desired structures be removed, there is danger of recurrence from reimplantation.

In large, broad-based, friable tumors, much injury may be done by scraping or tearing. The bladder soon fills with blood which is hard to remove and decomposes when the necrotic masses often cause cystitis and suppuration. Syringing the bladder with ice-water and astringents is painful.

If the pain, loss of blood, and cystitis are aggravated by operation, it is hard to convince the patient that anything has been done for her relief. In extensive involvement or growths with a broad base the preliminary incision of the bladder is more effective and satisfactory, as by it the diseased structure and the field of operation are exposed to view and to more effective manipulation.

Vaginal Incision. As a guide a catheter is introduced into the bladder, upon which a longitudinal incision is made through the middle line of the vagina, about five centimeters long, of sufficient length to permit the introduction of two fingers. The incision can be enlarged with scissors or with a knife above and below, affording considerable exposure of the bladder and its morbid growths.

Bleeding vessels are secured by pressure forceps. The growths are then removed with forceps, scissors, knife, fingers, the galvanic loop, or the Paquelin cautery. In copious hemorrhage syringe with either ice-water or quite hot water; cotton sponges wet with the latter may be pressed upon the bleeding surface. Sutures cannot be used well because they cut through. Precaution must be exercised to avoid injuring the ureters. Hemorrhage is very severe in these operations and greatly obscures the view. The fistula should be closed, a catheter introduced, and the vagina tamponed to compress the bladder and decrease the bleeding. An ice-bag should be applied over the lower abdomen.

The trifling mobility of the bladder in the region of the trigone renders it difficult to expose a bleeding vessel through vaginal incision, and the bleeding renders the field but little more accessible to view than through the dilated urethra, while through the latter the organ can be tamponed even more effectively than by the vaginal incision. It has been advised that operation for removal of tumors of the bladder should be preceded a month or six weeks by double nephrotomy for the establishment of drainage. Such a procedure is especially valuable when it is intended to remove the bladder, as the opportunities for the patient are much better than in the insertion of the ureters into the intestine and her comfort greater than if the ureters are inserted into the vagina.

Abdominal Incision. A transverse incision gives more room than a vertical, though the two may be combined in a **T**-shaped cut. The difficulty in securing firm union and thus avoiding subsequent ventral hernia, however precludes its frequent practice. The vertical incision requires strong traction to be made on each side. Fritsch prefers the transverse incision, claiming that recovery is excellent if the incision is not over six or seven centimeters. The scar so disappears under the hair of the mons veneris that it is seen no more subsequently, even if the wound heals by secondary intention. It has the additional advantage that large vessels are not likely to be cut. He has seen a number of cases in which extensive hernia had formed above the symphysis, but these were cases in which the object of the operation had been castration, suprapubic transverse section having been employed in the operation for castration, or cases in which the Trendelenburg posture had been employed for operations upon bladder fistula. In all these cases the scar tissue could still be seen. In twelve of these cases the incision had been twelve or more centimeters long. Such an extensive incision is unnecessary in bladder operations. If the incision is made shorter, the recti unite with a firm scar to the pubic bone.

Fritsch operated as follows: After the mons veneris and vagina have been thoroughly cleansed, and the bladder also irrigated with several liters of boric acid solution, the patient is put in the Trendelenburg position with the pelvis elevated. It is better to employ a large quantity of water than a trifling quantity of disinfectant solution. If the urine is clear or the discharge of blood quite fresh, syringing is unwise, as it can easily cause a hemorrhage. An assistant places his hands upon the abdomen in such a way as to keep the movable skin fixed, while a transverse incision is made above the symphysis. The point at which the incision is to be made should be fixed before the skin is put upon the stretch otherwise upon drawing it up it may be found that the incision is too low. It should be made directly over the upper border of the symphysis. While one is operating in the loose fatty tissue behind the symphysis, an assistant pushes up the bladder with a thick male catheter. The projection made by the end of the catheter is readily seen, the tissue above it is picked up with a tenaculum, and the bladder-wall is cut transversely above the end of the catheter. As soon as the bladder is opened the margin on either side is seized with a pair of pressure forceps and the bladder is prudently drawn down so that the forceps will not tear. The catheter is removed and the incision extended right and left by scissors until a broad wound is made in the vertex of the bladder, which will permit one conveniently to enter it with two fingers and inspect its inner wall. In this, as in all operations, it is important to proceed rapidly. The margin of the bladder is seized by ten or twelve pressure forceps, which hold the bladder open automatically and make its cavity visible. To sew the bladder to the margin of the wound would take more time. If the tumors are large and deeply situated, they may be discovered to the right or left by two fingers. The pedicle is seized between the fingers and the tumor prudently drawn up. As the structure tears easily, the bleeding point may sink back and vanish from view; when the bleeding is copious, one may be in doubt just what shall be done. It can be controlled promptly only through tamponade, which takes time; consequently, it is important, if possible, not to tear the tumor.

Having fixed the situation of the tumor one must make the pedicle accessible. Often this may require an enlargement of the incision into bladder and abdominal wall. An assistant presses the region of the pedicle upward from the vagina. Hemorrhage may be controlled by a Paquelin thermocautery. The smallest points should be used in order to avoid extensive burning of the bladder epithelium. The ideal agent is the galvanocautery. In small polypi and very small tumors the galvanocaustic loop does not act so well. To tie them off is, of course, difficult as the thread easily cuts through. Frequently the base cannot be encircled, on account of the proximity of the ureters. A deep ligature in the firm tissue may injure or occlude the ureter. A hot iron is not effective in arresting the bleeding, and yet this must be controlled in order to proceed. More favorable action is accomplished by long and continued direct compression of the wound from the vagina and bladder. A strong vaginal tampon has a good influence. Ice-water may be used with advantage, and influences the closed bladder still better. In the open bladder the influence is not direct on the bleeding vessels, as the bladder muscle, like that of the uterus or the placental part, contracts on the bleeding surfaces. When the pedicle is quite visible, so that one with the Paquelin can touch the proper place, we should employ the scissors to cut the growth away. The smooth, well-marked, cut surface can be compressed by the finger of the assistant, in the vagina, with a certain advantage. It may be necessary to tamponade both vagina and bladder and to apply a firm abdominal bandage.

When the surface is exposed, hemorrhage is most effectively controlled by infiltration of the structures with 1: 5000 adrenalin chlorid. I have seen large vessels contracted so effectively as to prevent what threatened to be a severe hemorrhage.

The means by which hemorrhage is to be controlled must be determined upon rapidly, whether it be the Paquelin, the application of a solution of iron, syringing with ice-water, compression with needle clamp forceps, or infiltration with adrenalin solution. The tampon should be prepared in advance. Large broad-based villous growths should be subjected to the sharp curet and scissors. Hemorrhage is often quite considerable. If the tumor is situated in the trigonum, so that there is no danger of injury of a ureter, the base of the bladder-wall can be penetrated and ligated. The possible discharge of urine through stitch-holes is of no significance, for in Shucking's operation for uterine fixation it is probable that the needle has frequently entered the peritoneal cavity, and it is only in rare cases that peritonitis appears. The necessity of preventing hemorrhage by a tampon after the operation excludes the possibility of complete suturing of the wound. We can, of course, draw together the bladder wound somewhat, as well as diminish that in the skin by lateral sutures, but in the middle it must be kept open for the eventual renewal of the tampon. In such cases it should be the rule to sew the bladder to the skin wound, in order to make its cavity accessible and to secure the tissue behind the bladder from overlying urine and wound secretion. As the patient recovers, the bladder suture cuts through, the organ sinks back, and the wound opening is gradually closed by granulations. When the opening continues too long, it should be narrowed by suture after artificial freshening of the wound. A permanent catheter should be introduced. This is necessary in all bladder injuries. With an incision into the bladder vertex, or in bladder resection, do not close the bladder wound completely, but place a strip of iodoform gauze in the opening left in the wound. It has repeatedly occurred that the patient accidentally or purposely has had the catheter removed, when the urine can flow from the wound without injury; but if the wound is entirely closed, the removal of the catheter would work injury to the processes of recovery. After the bladder tampon is removed hemorrhage rarely occurs. Bloody urine disappears in from twenty-four to thirty-six hours after the removal of the tampon. While the catheter remains the bladder should be irrigated with astringents or a weak solution of liquor aluminii acetici. This direction applies also to the external wound, and the pledget should be wet with the same solution. The upper wound has a great tendency to close. If the granulations are weak, as in anemic patients, they can be stimulated by dilute alcohol, camphor, silver salts, or tincture of iodin. The appetite, which is lost through an excessive flow of blood from the tumor, improves, and the patient gains rapidly in weight. The patient should be permitted to rise from bed as soon as the wound is healed. When the operation is very late in the progress of the disease, the wound remains unaltered, the patient does not recover from the anemia and does not regain her appetite. Whether the patient dies from loss of blood, from loss of strength or from the influence of the operation is difficult to determine.

The frequency of infection in the space of Retzius has led the majority of surgeons to the transperitoneal course for the removal of vesical tumors. An incision is made in the median line through all the structures of the abdominal wall, the bladder is raised, its peritoneal covering incised and stripped back, or the incision is carried through the bladder-wall. The intestines have been walled off previously and are held back by gauze packing. A sheet of rubber dam may be introduced about the bladder to prevent soiling the peritoneal cavity by its contents, and as it is opened, the urine can be absorbed and removed with gauze sponges. The bladder can be spread out and its entire cavity inspected. Growths can be seized and held with fenestrated forceps and excised with thermo-cautery. Ordinarily it is wise to excise the entire bladder-wall with the growth. When the tumor is situated near the ureters, one or both may be injured. This will necessitate reimplantation. Where a large portion of the bladder has to be removed for any reason, or the severed ureters are too short to admit of their reimplantation into the bladder, they should be brought out on the loins through the triangle of Petit. When the tumor occupies the fundus of the bladder it should be excised and the wound closed with the Connell's suture, which can be covered with a second row in the peritoneum. The abdominal wall is closed as in the ordinary operative procedure and the bladder drained by a permanent catheter until the vesical wound has united.

In the event of the bladder being so extensively involved that its extirpation is desirable, lumbar nephrostomy with ligation of the ureters, as suggested by F. S. Watson, should precede the extirpation by a month or six weeks. Permanent renal fistulæ are thus established and the urine does not complicate the subsequent operation. Nephrostomy also affords opportunity to prolong life and lessen the discomfort in ineradicable cancer of the uterus and vagina when the ureters are being compressed by the extension of the disease. The procedure can be utilized also to obviate the distressing odor in vesico-vaginal fistula from malignant ulceration.

The extirpation of the bladder in woman is a comparatively easy procedure. After the peritoneal cavity has been opened by a median incision, the vesico-uterine reflexion of the peritoneum is incised and pushed off the fundus of the bladder. The latter is then separated by blunt dissection until it is only held by the structures about the urethra, when they are clamped on either side and the organ cut away. The clamped tissues are ligated with chromic catgut. As the course of the urine had been diverted by the previous nephrostomies and ligation of the ureters, the latter are cut when exposed without further consideration. When the uterus is involved either primarily or secondarily, and its extirpation is proper, its removal makes that of the bladder more readily accomplished as increased accessibility is afforded. Unless the peritoneal covering of the bladder has been sacrificed partially or completely because of its involvement, it is utilized to close off the peritoneal cavity and the raw surfaces beneath can be drained into the vagina by gauze packing.

THE VAGINA.

297. Cysts of the vagina are very rare, and are generally formed in the remains of congenital structures. (Fig. 473.) Tumors originating in the structure of the vagina are infrequent. Cysts are found as isolated tumors in the mucous and submucous membrane, in the former usually directly beneath the squamous epithelium. Rarely more than two or three occur in any individual case; Schröder, however, removed six from one patient. They are more frequently found upon the anterior wall, and are exceedingly rare upon the posterior. They vary in size from that of a pea to a hen's egg. The contents of these cysts are serous, more or less viscid or gummy, and are sometimes found mixed with blood. The epithelial lining of the sac may be either cylindric or laminated. The epithelium of some is ciliated (Abel). The origin of these growths is exceedingly difficult to determine. They have been attributed to the remains of Müller's, Wolff's, and Gärtner's ducts, to vaginal glands, or, according to Klebs, to dilated lymphatics. Neugebauer attributes most of them to remains of Gärtner's canal. Hematoma of the vagina may serve as the origin for a cyst. Glands of the urethra may form retention cysts, and, as they develop, may project into the vagina.

The *symptoms* will depend upon the size of the cysts. Ordinarily, they produce no inconvenience nor discomfort. Recently a patient underwent examination for a pelvic disorder, when a cyst the size of a walnut was found upon the posterior wall.

Diagnosis. Vaginal cysts may sometimes be mistaken for cystocele or urethrocele. The use of the catheter during examination will demonstrate the thickness of the septum and the presence and size of the cyst.

In the upper part of the vagina cysts are confounded with small tumors in Douglas' culdesac, such as prolapsed ovaries, a noncystic inflammatory condition of the tubes, and other inflammatory collections. A second vagina, which is closed and filled with retained secretion, may simulate a cyst.

Treatment. Only the large cysts require any treatment. The cyst may be opened and the sac cauterized most effectually with the actual cautery; or it may be packed with iodoform gauze, which affords drainage and sets up sufficient inflammation to obliterate it; or the entire sac may be enucleated.

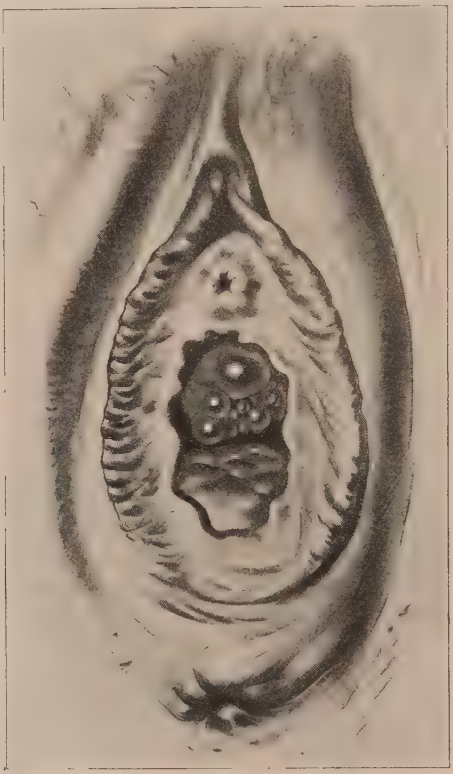


Fig. 473.—Cysts of the Vagina.

298. Fibroid tumors and polypi originating in the vagina are very rare. They develop in the submucous or deeper layers of the mucosa and push into the vagina. As they increase in size they become polypoid, and hang by a pedicle. The structure is similar to that of uterine fibroids, and the growth is slow. The most common situation is the superior portion of the anterior wall. They are often adherent to the urethra, and distend the vulva. They are usually small, although they have been reported as weighing two and one-half pounds. Bandier and Gremlier report one weighing ten pounds. I am indebted to the late Dr. John C. DaCosta for the illustration (Fig. 474) of a specimen which he removed from the vagina. As these growths increase in size, they become softened and ulcerate. They are more apt to develop during the period of sexual activity, although Tratz reported one in a child of fifteen months which attained the size of a man's fist, and Martin one 3/4 of an inch long in a child two days old.

Symptoms of the growth are largely dependent upon its size. If small, the tumor may remain unrecognized. Larger growths cause dysuria and retention of urine. They project from the vulva, and the traction produces bleeding, ulceration, and erosion.

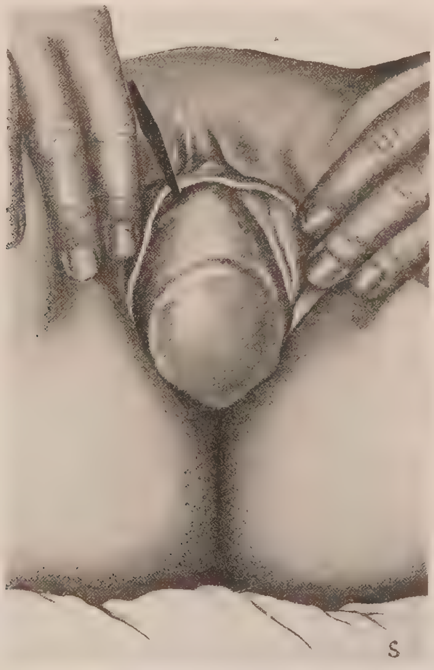


FIG. 474.—Myoma of the Anterior Vaginal Wall. (*Dr. John C. DaCosta.*)

Diagnosis. The growths are readily determined by their situation, slow growth, and mechanical disturbance. The softening, ulceration, and hemorrhage may sometimes lead to a diagnosis of malignant disease.

Treatment consists in the removal of the growth by enucleation in sessile tumors, and by section of the pedicle in polypus. Hemorrhage is controlled by ligature or suture.

299. Papillomata. Papillary or warty growths are found in the vagina, generally in association with similar growths about the vulva. Usually they appear as small isolated projections over the walls, but occasionally the entire vagina will be filled.

300. Malignant neoplasms of primary origin are very rare in the vagina. They most frequently extend from the uterus, rectum, vulva, urethra, or bladder, in one of three forms: 1, papillary; 2, infiltrated or nodular both of which are included histologically under epithelioma; 3, sarcoma, either diffuse or circumscribed. The commonest form is the papillary although we may have carcinomatous infiltration, either circumscribed, forming a broad-based excrescence, or a substitution of scirrhous for the normal tissue.

Etiology. Malignant disease is most frequent during middle age. It is rare in youth, although I have seen one case of cancer of the vagina in a woman of twenty. Hegar once saw it when it was attributed to the irritation induced by a pessary. Epithelioma of the papillary form usually affects the posterior wall, as a broad-based excrescence which rapidly invades the culdesac and extends downward toward the vulva. Epithelioma of the nodular or infiltrated form appears as nodules which become confluent, sometimes localized about the wall of the urethra The ulceration advances rapidly, and may burrow into neighboring organs, producing rectovaginal or vesicovaginal fistula. The disease extends

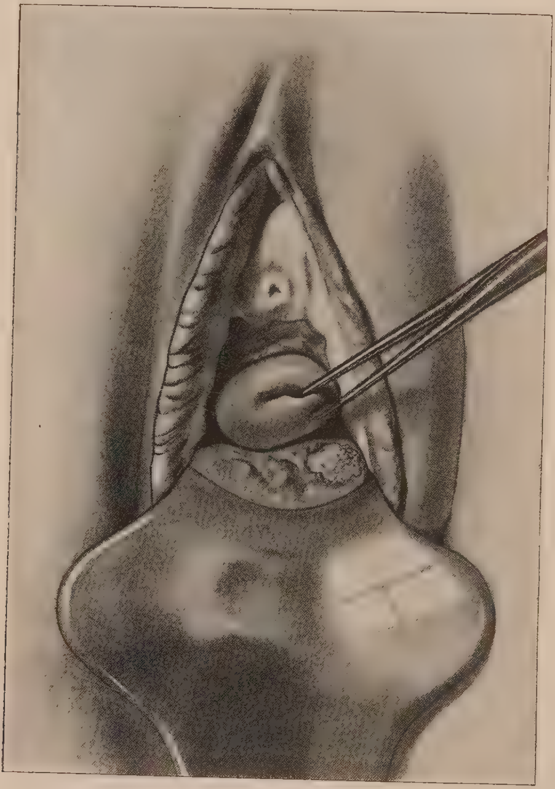


FIG. 475.—Primary Cancer of the Vagina.

by the lymphatics the pelvic to cellular tissue. When it is situated in the anterior wall, the lymphatic glands of the groin are also involved.

Symptoms. Very early, vaginal epithelioma causes hemorrhage, which will be aggravated by locomotion, coition, or the various procedures in examination. There is a profuse purulent discharge which is exceedingly offensive. Pain is not so marked as in disease of the uterus, unless in the later stages. The principal symptoms are the mechanical obstruction to coition and to delivery from stenosis, and the watery, bloody, and offensive purulent discharge. In a case recently under observation the disease had involved the anterior wall of the vagina, having apparently originated in the urethra. It formed a large scirrhus-like mass extending upward over one-half the anterior vaginal wall. The patient suffered from great inconvenience in urination, having frequent attacks of retention and severe pain.

Sarcoma occurs in two varieties: 1, the diffuse sarcoma of the mucous membrane, often seen in young children; 2, fibrosarcomatous growths, or melanotic sarcoma. Epithelioma, or cancer, may be distinguished from sarcoma by the use of the microscope. In the former we note the characteristic assemblage of the epithelial cells, forming the pearly bodies, and preservation of the walls of the blood-vessels; while in the latter, the cells are more or less unconfined by connective-tissue stroma and the blood-vessels appear as mere sluiceways or blood-channels.

Treatment. The thin wall of the vagina is but slightly resistant to the progress of malignant disorder, and the disease is rapidly transmitted by the lymphatic vessels to the deeper cellular tissue of the pelvis, so that by the time the patient affected with cancer or sarcoma comes under observation, little can be done in the way of treatment beyond relieving her from the discomfort produced by the accompanying symptoms. Complete recovery is rare. Von Eiselsberg, in a case of cancer which involved the whole of the rectovaginal septum, resected the coccyx and established an artificial anus in the sacral region after extirpating the whole of the diseased part. The patient rapidly recovered and had control of her stools. In a patient of mine, when the disease had proceeded from the rectum, involved the posterior wall of the vagina and the perineum, and extended close to the cervix, I removed the coccyx, resected the sacrum, excised six inches of the rectum, removed the uterus, ovaries, tubes, entire posterior wall of the vagina, and the posterior commissure of the perineum. The rectum was stitched to the sacrum posteriorly, and to the anterior wall of the vagina anteriorly, the peritoneum having been closed previously. (Fig. 542.) A colostomy had been performed upon the patient before she came under my observation. After the patient had recovered from the pelvic operation the opening in the intestine was dissected out and the two ends of the bowel were reunited. The patient was under observation for nearly thirteen months. The contraction of the intestine at the site of the former colostomy was sufficient to give the patient warning of the passage over it of feces, so that she could prepare herself for the evacuation of her bowels and avoid soiling her clothing.

THE UTERUS.

301. Myofibromata are benign growths of the connective-tissue order which occur in the cervix as well as in the body of the uterus. They consist of connective tissue or of muscular structure combined with connective tissue. Where the connective tissue predominates, they are designated by the term fibromata, and where the muscular structure, as myomata or fibromyomata. The pure myomata consist of little more than muscular structure and exist only in the early stages. They usually appear singly and may attain to a rather large size.

The myomata are the most frequent form of uterine growths. Careful examination will disclose such a growth in 20 per cent. of all the women who have reached the age of thirty-five years (Bayle), in 40 per cent. of women of fifty years (Klob), but in the great majority the tumors are small. The growth of a tumor is slow; when rapid increase in volume is observed, it arises, not from an increase of tumor elements, but from a disturbed condition of tissue fluid, which will be considered later. The most favorable condition for rapid growth is an intimate vessel union with the uterus.

It is the generally accepted view that fibroid growths increase in size only during the period of sexual activity, and remain stationary or undergo atrophy after the climacteric. It is quite probable that no myoma ever originates in the uterus prior to puberty nor subsequent to the menopause. A tumor has been reported as having been found in the uterus of a girl aged ten years, but no opportunity was afforded to demonstrate the correctness of the diagnosis by microscopic investigation.

Sutton reported a childless widow, who had never menstruated, but who had carried such a tumor for ten years. Peter Muller and Joseph Taber Johnson both assert that sometimes the growth continues to increase after the cessation of menstruation. Hofmeier says that such increase occurs in those myomata which stand in nutritive union with the peritoneum through organized bands of adhesion. The truth of this is especially indicated in omental adhesions, which greatly influence the progress of the growth. He cites a woman in whom a thirty-five pound myoma, with numerous interstitial and omental adhesions, had continued to grow for a year after the menopause.

A solitary myoma is rarely found in the uterus. The disease generally exists as a multiple tumor formation. Over fifty growths have been found in one uterus. J. Bland-Sutton reports a uterus which contained one hundred and twenty myomatous growths, varying in size from a pea to an egg. They vary from a tumor the size of a pea to an enormous growth. After death Hunter removed a tumor that weighed 145 pounds from a woman whose body subsequently weighed but ninety-five pounds.

How much the growth of myomata is influenced by the activity of the sexual organs remains difficult to determine, but the fact that myomata originate and have their greatest growth during the years most favorable for procreation cannot be without significance. Myomata occur with about equal frequency in the married and unmarried. Observation does not justify the assertion that the size to which they attain or the rapidity of their growth is influenced by the married or the single state. Some regard sterility as a cause of myomata, others as a consequence.

Winckel and Schröder state the following conclusions:

1. Fibroid growths originate without relation to marriage or to pregnancy.
2. Sexual excitement favors growth.
3. The presence of a growth inclines to prevent child-bearing.
4. Pregnancy promotes growth.

Pathologic Anatomy. Whatever the origin, fibroid growths are found in either the body or the cervix of the uterus, in larger proportion in the former situation, and more frequently in its posterior wall.

The consistence of the growth varies with its structure. A soft muscular mass presents, upon section, a reddish-pink color. Wavy, glistening bands run in every direction, but have a tendency to form whorls about individual centers, owing to the origin of the disorder along the course of blood-vessels. The cut surface of a fresh section presents an uneven appearance, because the elasticity of the fibrous tissue causes the softer muscle surfaces to bulge. The mass is enveloped by a false capsule, produced by compression changes in the uterine structure. The capsule varies in thickness according to the site of its development. If the growth has originated in the middle layer, the capsule is thick and well formed; but if immediately beneath the peritoneum or the mucous membrane, the capsule will be very thin or even may be absent.

About the tumor is a layer of loose connective tissue which permits ready enucleation. Occasionally there are numerous fibrous bands to the capsule, which render enucleation difficult, and are so frequent as to appear like a hyperplasia.

The tumor is surrounded by numerous large vessels, from which it is nourished, but they do not penetrate its substance to any great depth.

The vascularity of the structure is slight as compared to that of the uterine wall, for well-formed vessels are rarely found away from the circumference. In the softer variety the blood-vessels are comparatively numerous; in the harder varieties they are scant.

Microscopic Appearance. The comparative amount of muscular and connective tissues varies widely. In young and rapidly growing tumors the muscular tissue predominates and the capsule or line of demarcation between growth and uterus is ill defined. As the tumor becomes older and more mature, there is a substitution of connective for muscular tissue, and the growth becomes hard and dense. (Fig. 476.) The section differs in appearance according to its direction. A longitudinal section presents cells of an elongated shape with rod-like nuclei, while a transverse section resembles groups of round cells. Occasionally between the muscle bundles are spores—lymph-glands lined with endothelium. They develop from cellular proliferation about the capillaries, and, with increase of connective tissue, may grow to large size. (Fig. 477.)

Varieties. Bishop follows Gusserow's classification and divides myomata into the multiple and encapsulated and the single and nonencapsulated. The former are found most largely in the body of the uterus, while the latter grow from the cervix. This division is based upon structure. The multiple growths are hard and firm. They consist largely of fibrous tissue, apparently mature, and no longer continue to grow. They are also called fibromata. The single growth is soft and elastic. Largely supplied with vessels, it is rapid in growth. In its structures the muscular tissue will be found to predominate. Single structures are known as liomyomata or fibromyomata. All myomata originate within the uterine wall, but upon their proximity to its inner or outer surface will depend their future progress. The most frequent classification, and the most useful in practice, is a division of myomatous growths according to their situation into: 1, Submucous, intramural, or concentric (capsulated, nonencapsulated); 2, interstitial, mural, or centric; 3, subperitoneal, extramural, or excentric (capsulated and nonencapsulated); and 4, fibromyomata of the cervix.

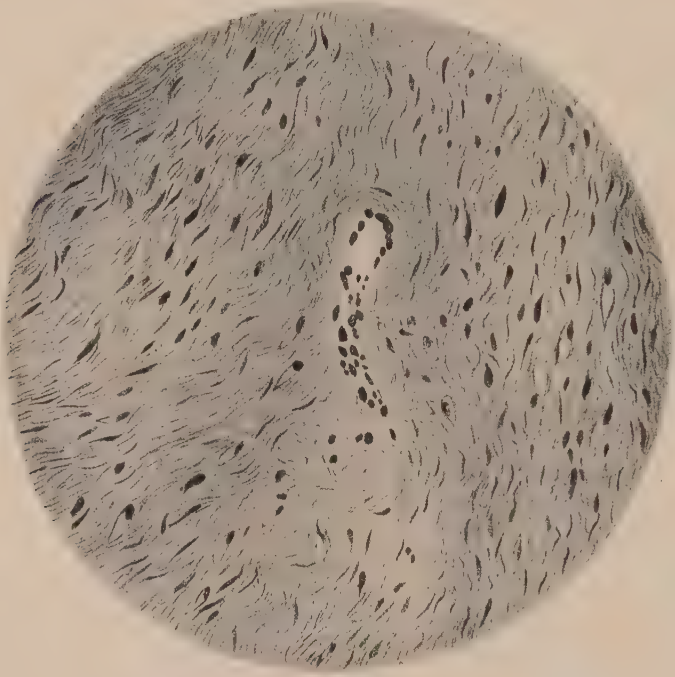


FIG. 476.—Microscopic Section; Myoma Uteri. (*Coplin.*)

Degenerative changes which may occur in the life-history of such a growth are indicated by the terms edematous, colloid or myxomatous, fibrocystic, calcific, necrobiotic, necrotic; but these changes are not sufficiently constant to justify their employment to indicate a distinct classification.

The same statement can be applied also to the further division which is sometimes given: sarcomatous, adenomyomatous, telangiectatic, lymphangiectatic.

302. **Submucous fibroids,** according to the proximity of their origin to the mucous surface, present two varieties—the encapsulated and the nonencapsulated or free. The former develop in the wall and are extruded beneath the mucous membrane by the uterine contractions. The second variety, the free, originate immediately beneath the internal surface, and are not supplied with a capsule, but are closely enveloped by the mucosa. An encapsulated tumor may become free through absorption or thinning of its capsule from pressure.

The encapsulated variety is much larger than the free. Nature regards such growths as foreign bodies and endeavors to extrude them from the uterine walls. Under this action a submucous fibroid may become pedunculated, when it is known as a submucous or fibroid polypus. (Fig. 478.) The muscular capsule may resist expulsion and prevent pedunculation, while the tumor bulges into the uterine cavity from a more or less broad base, and is called a sessile submucous fibroid. (Fig. 479.)

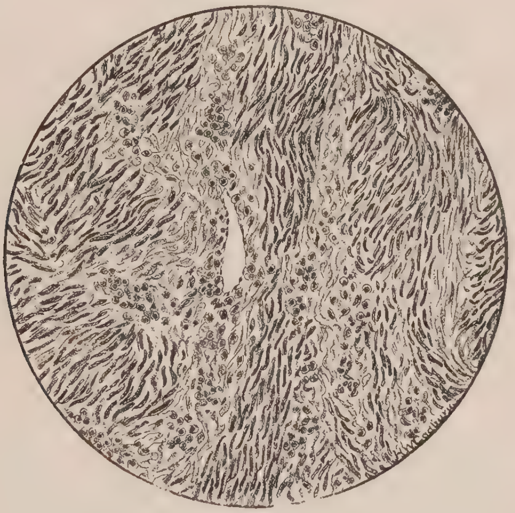


FIG. 477.—Liomyoma of the Uterus. B. and L., 1/6 in. obj.; 1 in. oc.

The sessile and pedunculated submucous tumors enlarge the organ and increase its vascularity. (Fig. 480.) The repeated contractions, together with the expulsive efforts, lead to hypertrophy of the muscle-wall to such a degree as to simulate pregnancy. The circulation in the entire mucous membrane, and especially in that portion covering the tumor, becomes obstructed, leading to severe hemorrhages.

The severe pressure frequently causes atrophy and ulceration in the free variety, and the production of grave secondary changes, such as sloughing and gangrene. Compression of the neck of a polypus may cause edema, and when acute, can produce gangrene or sloughing of the mass, and a fatal termination. In the slower form the chronic edema often may be mistaken for a cyst. Uterine contraction may lead to elongation of the pedicle of a pedunculated fibroid and cause its extrusion from the external os into the vagina, where it can be recognized readily and removed. (Fig. 481.) The elongation of the pedicle may become sufficient to permit the mass to hang from the vulva. The expulsion into the vagina may be sudden, but generally it occurs slowly. Very rapid expulsion of a tumor with a short pedicle may produce partial or complete inversion. Not infrequently the polypus may be felt projecting from the os during menstruation, while it disappears during the intervals; this condition is known as intermittent polypus.

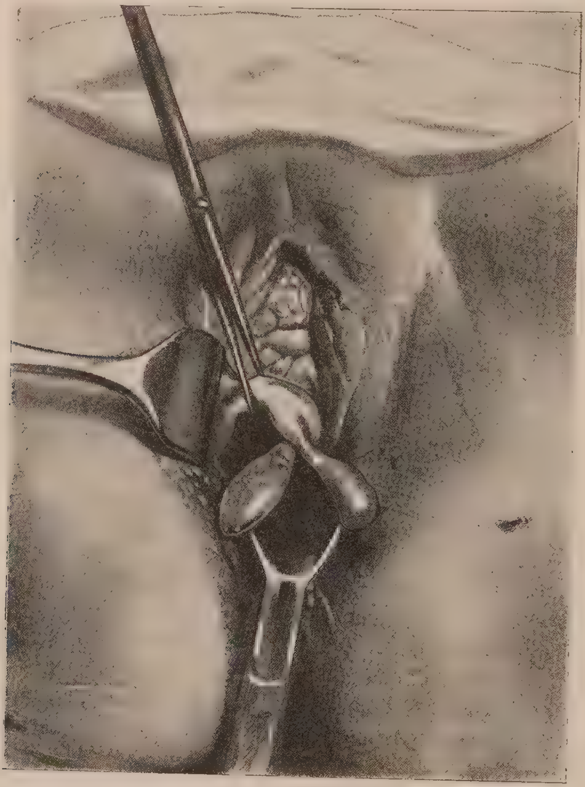


FIG. 478.—Submucous Myoma (Polypoid).

In rare instances the tumor may be completely and spontaneously separated and extruded by the efforts of the uterus.

The pressure of the uterine or vaginal wall upon the tumor sometimes causes ulceration, from which adhesions may form and by which the nutrition is maintained. A polypus may be so firmly gripped by

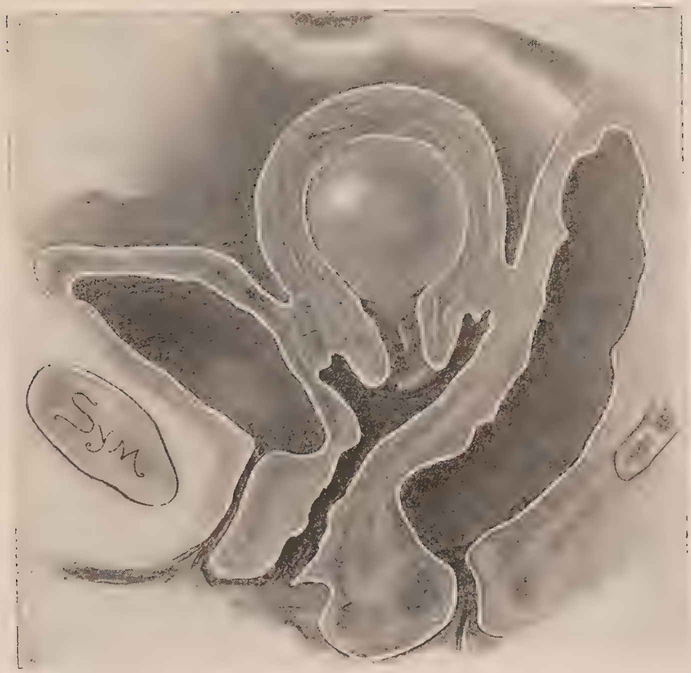


FIG. 479.—Sessile Submucous Myoma.

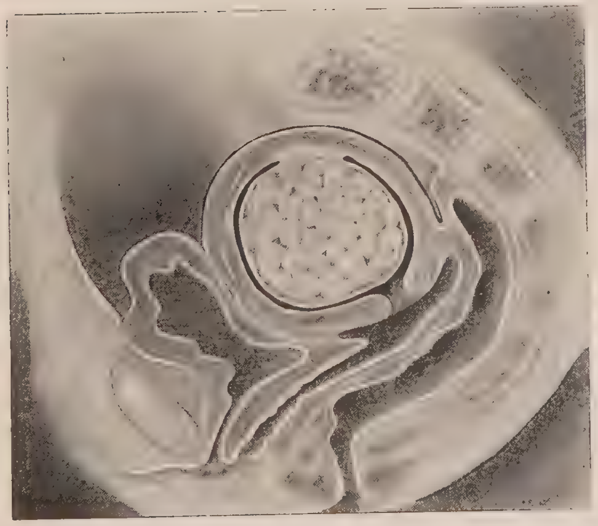


FIG. 480.—Submucous Myoma Occupying Uterine Cavity.

the cervix as to cut off its supply of nutrition and cause it to slough. The gangrene may spread upward and produce a fatal result. Such a condition can easily be mistaken for cancer.

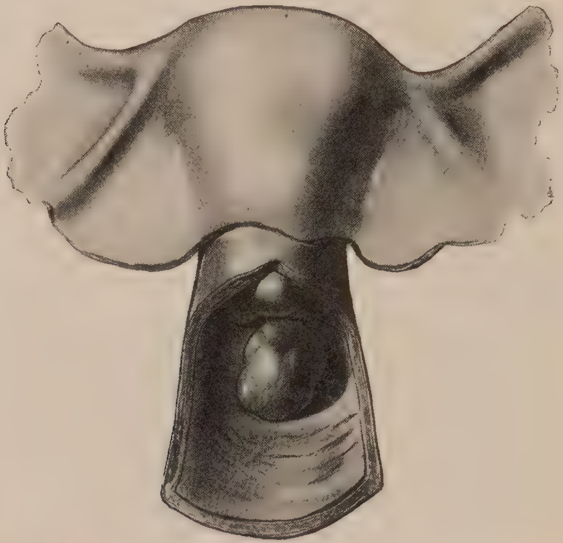


FIG. 481.—Submucous Myoma Extruded into the Vagina.

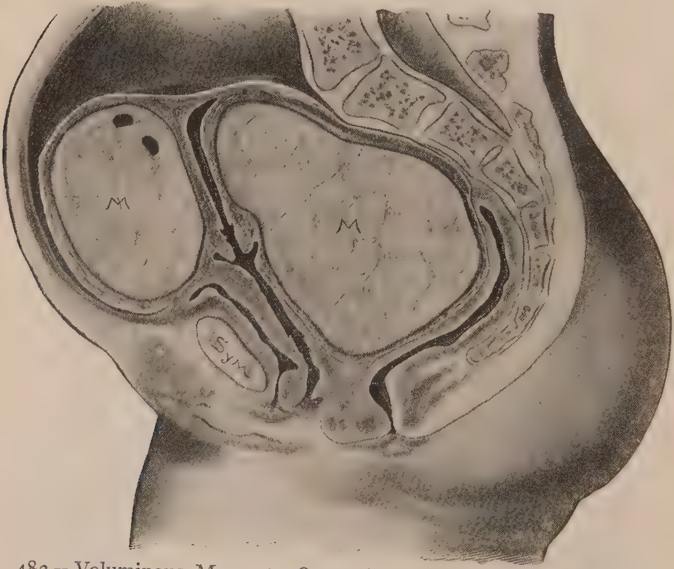


FIG. 482.—Voluminous Myomata Occupying Anterior and Posterior Walls.

303. Interstitial, mural, or **centric fibroid growths** develop in the parenchyma of the uterus, frequently attain to enormous size, and involve

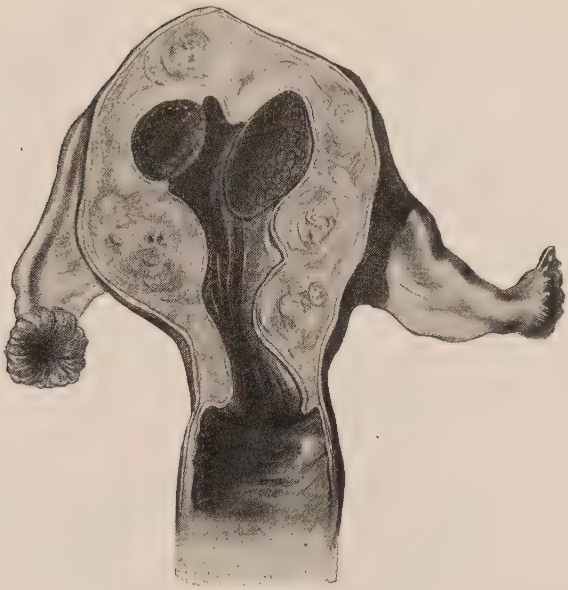


FIG. 483.—Local Interstitial Myomata.

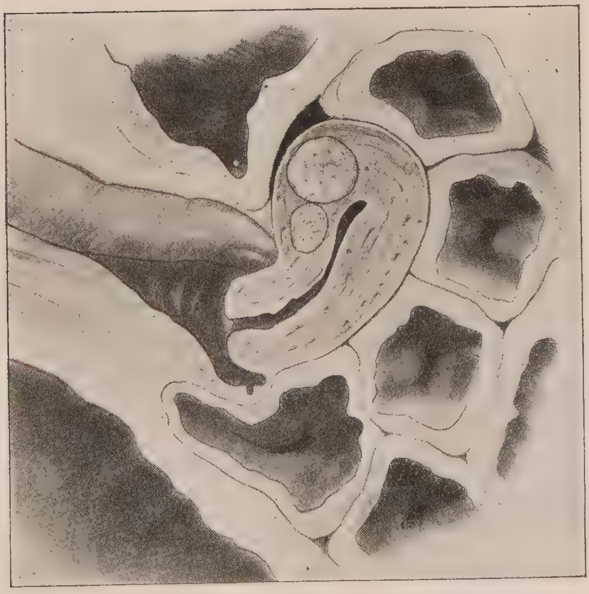


FIG. 484.—Circumscribed Interstitial Myomata.

the entire structure of the uterus, when they are then known as the diffuse or the gigantic fibroid. (Fig. 482.) A second variety is the circumscribed general form (Fig. 483); the third, the local interstitial fibroid. (Fig. 484.) In the general circumscribed variety, as described by Schröder, the wall of the uterus may be filled by a large number of growths. In the localized fibroma a single or two or three interstitial fibromata may be found. These growths are situated in the wall of the organ, surrounded by muscle-fibers and the loose connective-tissue capsule, from which they readily can be enucleated. In the diffuse form the entire structure of the uterus seems to be taken up by the growth, and it is difficult to fix a sharp border of limitation between the growth and the uterine wall. These growths, when they attain a large size, frequently draw out the lower portion of the uterus as a pedicle, which may be attenuated to the thickness of the finger and twisted, as seen in one case by Küster, where, in the twist, the torsion was two and one-half times. The cervical canal had been obliterated. Occasionally, the uterine body is found separated from the cervix. The muscular structure of the uterus itself undergoes hypertrophy in these cases, particularly when but few growths occupy the wall. The uterine wall becomes thickened, its cavity is increased, and the cavity undergoes various changes in its shape and size, according to the development of the tumor and its projection into it. (Fig. 485.) The influence of the growth upon the endometrium is most marked. In a large interstitial myoma it may become strongly distended, not infrequently thin and

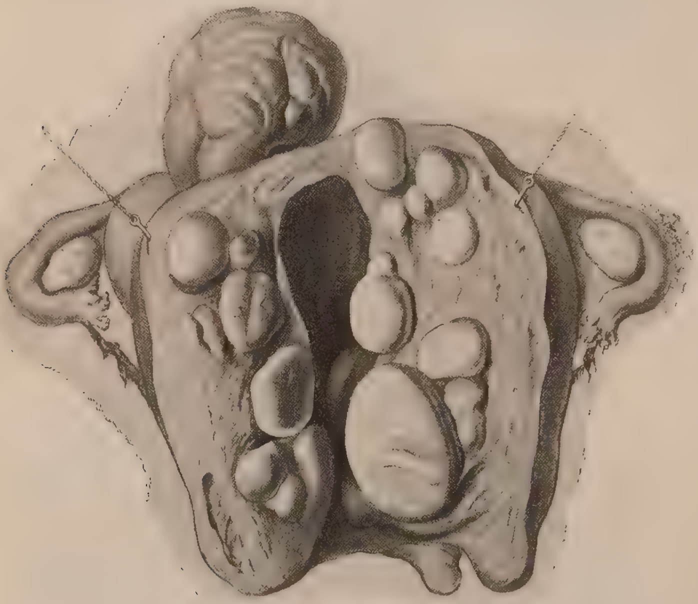


Fig. 485.—Uterus Opened, Showing Multiple Interstitial Myomata.

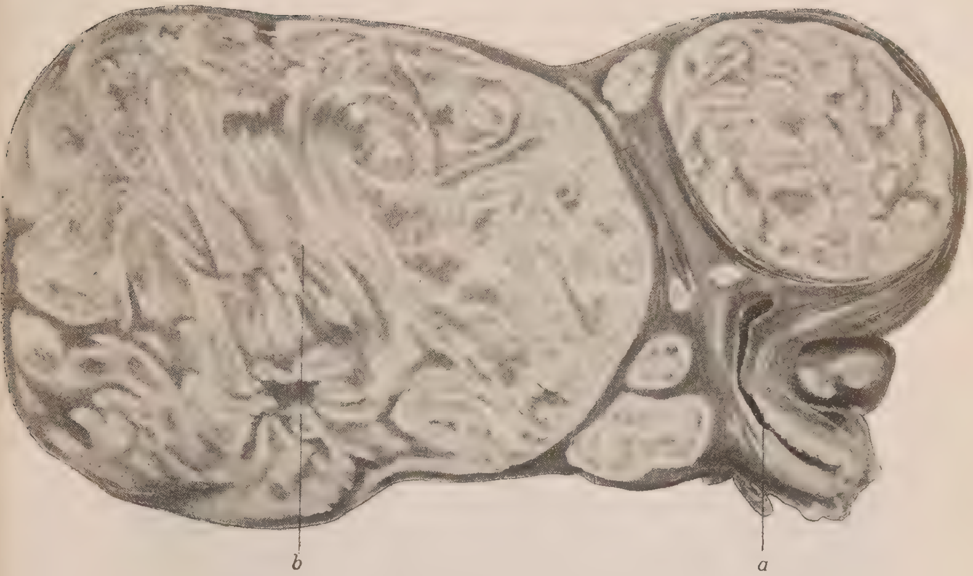


FIG. 486.—Sectioned Surface of Uterus, Showing Several Fibroid Tumors: *a*, Uterine Cavity; *b*, large subserous fibroid

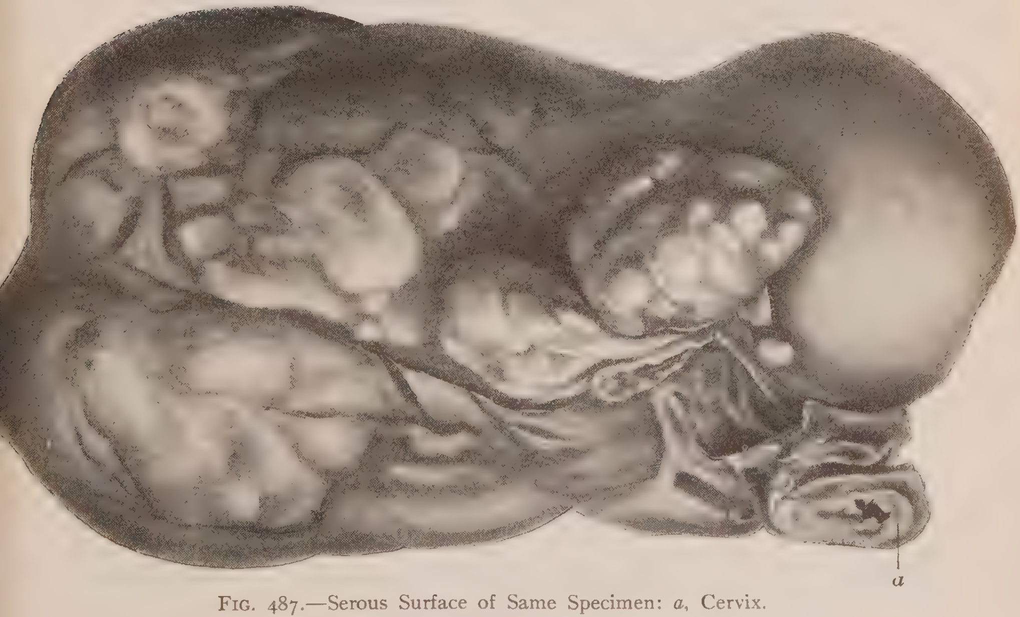


FIG. 487.—Serous Surface of Same Specimen: *a*, Cervix.

atrophied. (Figs. 486 and 487.) In other cases there is a hypertrophy of the entire mucous membrane, occasionally only of the glands; in others, the interstitial tissue between them is increased. (Fig. 488.) Occasionally, the condition is complicated by malignant edema. In the great majority of cases hypertrophy of the mucous membrane is found associated with these growths. (Fig. 489.) Indeed, the endometrium may be three or four times its normal thickness.

304. **Subperitoneal growths** (also called subserous, eccentric, or extramural) are generally spheric or ovoid masses springing from the external surface by a more or less distinctly marked pedicle. Like the submucous, these growths are sessile or pedunculated. While the latter class are polypi, that term is more generally applied to intra-uterine growths.

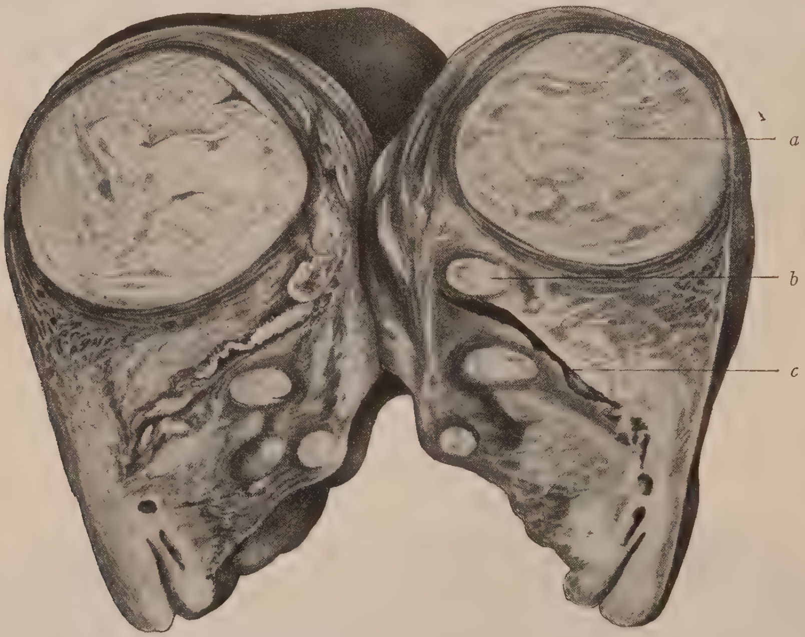


Fig. 488.—Uterus Incised, Containing Interstitial Fibromyomata: *a*, *a*, Tumors; *b*, uterine cavity.

The surface of the growth may be smooth or irregular, according to the contraction of the connective tissue. A division into free and encapsulated is made: the former covered by the serous layer, which is closely attached, without capsule, to the surface of the tumor; the ,latter or encapsulated, are covered with a layer of muscle-wall beneath the peritoneum.

The free are hard and only attain a small size; the encapsulated are soft and often become enormous. The pedicle of the tumor varies in length and thickness. It may be short, thick, and permit but little movement between the tumor and the uterus, or long and attenuated, affording such marked freedom as to cause doubt whether the growth is connected with the uterus. The pedicle can sometimes become so twisted as to cut off the circulation of the tumor and lead to its loss of vitality, the development of gangrene, and subsequently to septicemia or peritonitis; or the tumor, in more fortunate cases, may become adherent to the surrounding viscera and lose its association with the uterus. Such a growth is nourished by its adhesions. Not infrequently a very movable tumor causes ascites, and thus simulates a malignant growth.

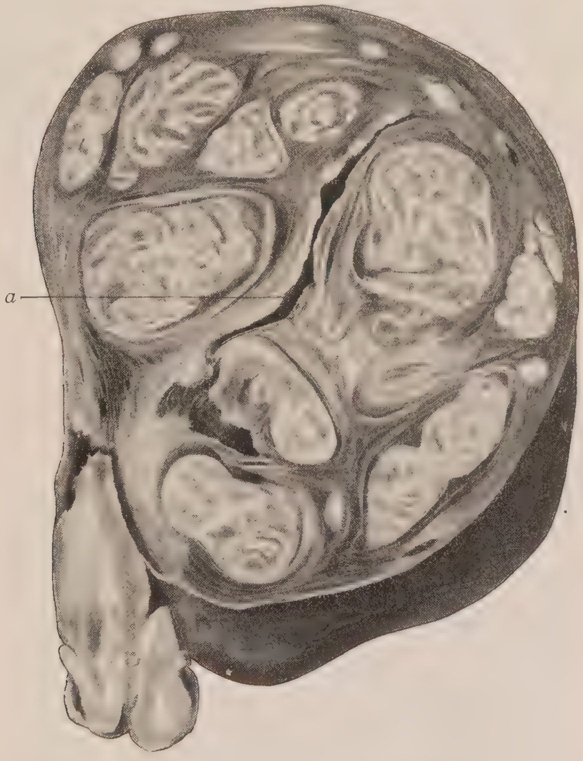


FIG. 489.—Uterus Incised, Showing General Circumscribed Fibromyomata: *a*, Uterine cavity.

305. Fibromyoma of the Cervix. Cervical myomata, like those of the uterine body, are submucous, interstitial, and subserous. These growths originate in the body of the organ, and, by the process of enucleation through contraction, may have been driven downward, either through the cervical canal or into its structure by splitting it externally or, as in the single noncapsulated tumor, had its origin in the cervix and grown either upward or downward. Single tumors may be either pedunculated or sessile, and rarely attain a size larger than a goose-egg, although they may completely fill the pelvis. (Fig. 491.) They cause contraction and prolapse of the uterus, and simulate inversion of the organ. They may be divided into two classes:

1. Those of the external os, in which the tumor is formed by a cylindric or elongated lip in the interstitial variety. (Fig. 492.) The submucous growths of the cervical canal are occasionally polypoid, which like slender stalactites, descend through the cervix by the splitting process.

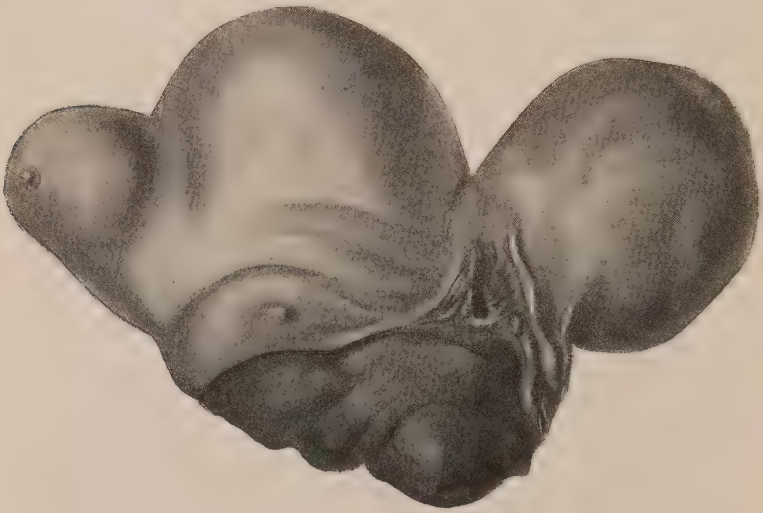


FIG. 490.—Subserous Myomata.

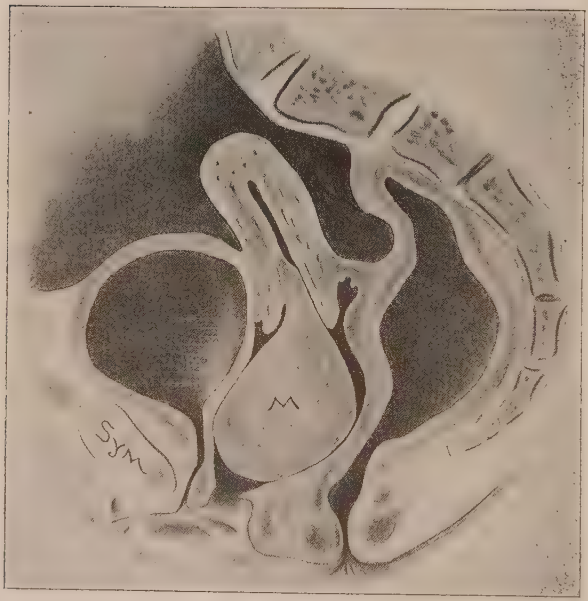


FIG. 491.—Pedunculated Myoma of the Cervix.

2. Tumors from the subvaginal portion. These are more important

when developed from the external surface and situated between the layers of the pelvic floor. They become intraligamentary and exceedingly dangerous by pressure upon the ureter or upon the pelvic vessels; also when posteriorly they press upon the rectum and push the uterus forward and upward. Occasionally, the tumor crowds anteriorly against the bladder, between it and the uterus. Generally these tumors are found surrounded by a loose capsule, which permits of ready enucleation. Sometimes, however, there is no line of demarcation between the tumor and the uterine structure.

Etiology. These growths occur more frequently than any other to which women are subject. Not infrequently they may attain to considerable size without the patient being aware of their existence, and are then recognized only by accident. The causes of their development are unknown. Recklinghausen attributed their origin to embryonic tissue, the remains of the Wolffian bodies. The irritation which characterizes fibromata is not a physiologic irritation, like that of pregnancy, but a diseased impetus. It is an unusual kind of local irritation, associated with a weak or debilitated condition of the concerned spot. This introduces Cohnheim's view of tumor origin, that the local irritation was brought to development by the presence of tumor germs. The influence of sexual irritation is appreciated, in that statistics demonstrate that in the majority of cases the first indications appear during the second half of the third decade—between the twentieth and thirtieth years. The tumor forms in the first half of the fourth decade, shortly after the thirtieth year. These growths rarely develop before or after these periods,

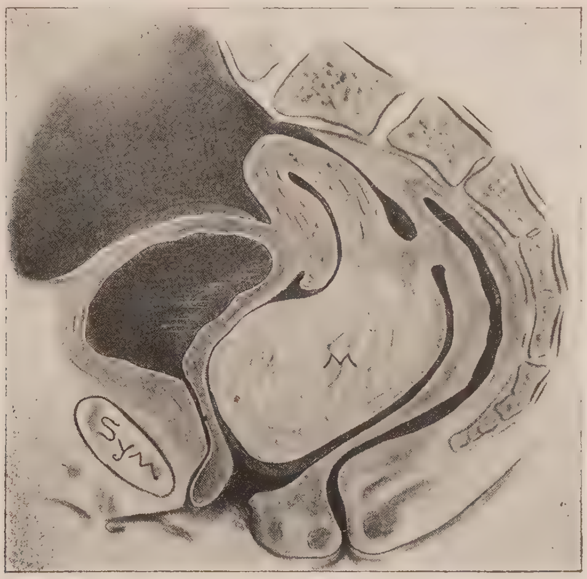


FIG. 492.—Sessile Myoma of the Cervix.

although Biegel is reported to have seen one in a girl ten years of age, and Leopold the beginning of a myoma in a child. There has been much discussion as to the influence of the married or single state upon the development of these growths. The investigations of Möller show that 32.8 per cent. occur in virgins, 67.2 per cent. in those who are not, but one-half of the latter are sterile. Hofmeier says that the number of births does not stand in any relation to the causal formation of the growth, while Winckel believes the married are more predisposed, and the myomatous formation decreases the number of births. Shoemacher, on the contrary, asserted that the unmarried are more frequently affected. Hofmeier accounts for the relatively large number of unmarried women who suffer from myomata by the explanation that the tumor formation is one of the few causes which lead them to consult the gynecologist. Prochownik gives syphilitic infection as a cause, but the growths occur so frequently in individuals in whom there has been no possibility of such infection as to render this view of little value. Olshausen and Gusserow assigned local irritation as the etiologic factor. Shoemacher also looks upon menstrual congestion as a cause, but to give these reasons for the development of the disease is equivalent to giving none, as it is necessary to seek further for the cause of the irritation. Möller, already referred to, frequently found that a myoma the size of a pin's head was separated from the uterine muscle by a distinct layer of connective tissue. Small arteries could be traced into the growths, which still retained their three coats; consequently he doubted the theory that myomata arise from the muscular coat of the blood-vessels. The cause is sometimes considered as congenital. The influence of heredity, as to whether there is a predisposition to the development of such growths in families, may be questioned. Heredity seems to be manifested in the greater apparent and comparative susceptibility of the colored race to the development of fibroid growths. It is not unusual to find several members of one family suffering from myomata. Among the various causes it is probable that sexual irritation should have the first place, and this irritation may have been engendered without the uterus having undergone the changes incident to pregnancy and labor. The abnormal irritation may be the result of masturbation, of psychic disturbances, of such unnatural processes as the evasion of maternity, of the psychic phenomena engendered by body-contact with man, of sexual agitation, and of other factors which may produce repeated injurious influence. It is quite possible that defective development or an abnormal position of the uterus may exert a marked influence in the development of these growths. Mann reports a childless widow at the age of forty-three, twice married, who had never menstruated. For ten years she had a large fibromyoma. It still remains evident, however, that in any individual myoma we cannot positively assign a cause which can be considered a definite reason for its development.

Symptoms which should cause a suspicion of the existence of myomata are hemorrhage, pain, and abdominal cramp, especially when associated with progressive enlargement of the abdomen. The symptoms of the individual case will depend on the variety of tumor present. In the subperitoneal or in the interstitial, which have not encroached upon the uterine mucosa, the growth may attain considerable size without manifestation of any symptoms which would attract the attention of the patient. Frequently, especially in the unmarried, such growths become so large as to be remarked by others before the patient is aware of the condition. The growth will be suspected where there is a history of slow but progressive enlargement of the lower half of the abdomen. Occasionally the first symptom will be the inability of the patient to evacuate her urine properly. There even may be complete retention requiring the aid of a physician. Then the tumor may be recognized for the first time. The tumor may be situated in the pelvis, fill it completely, and push the uterus above it. If the growth simply presses against the bladder, interference with evacuation may be slight, or, more likely, cause frequent micturition because of the inability of the bladder to distend. Urination may be so frequent and so painful as to lead patient and physician to suppose that cystitis exists. The growth may press upon the rectum, causing constipation, retention of gas, tympanites, interference with the circulation of the lower rectum, hemorrhoids, prolapse, marked anal pruritus, burning of the anus, the existence of a fissure, and often the veins of the anus as well as those of the vulva become varicose. Incarceration of a growth in the pelvis, may, by severe pressure on the surrounding structures cause sloughing and gangrene of the pelvic soft parts. (Fig. 492.) An intraligamentary tumor may push the uterus to the opposite side, and may be so large compared with it, that it will be difficult to determine the situation of the uterus. (Fig. 493.) Pressure of a tumor on the pelvic nerves may produce pain down the posterior surface of the leg in the form of sciatica, a crural neuralgia over the front of the leg, or marked pain in the sacrum. While such symptoms may occur in any form of myoma, they are more characteristic of the subperitoneal and interstitial varieties, especially when the latter has not encroached upon the uterine cavity. In the interstitial variety growing toward the mucous membrane and causing obstruction in its circulation and engorgement and degeneration of the overlying mucosa hemorrhage is a marked symptom. In the submucous varieties bleeding is a more or less constant and characteristic symptom. Hemorrhage may be manifested by an increase of the menstrual flow (menorrhagia) or an irregular bleeding (metrorrhagia) may result. Hemorrhage, as before stated, is a very prominent symptom of all submucous growths. The bleeding varies, and is not affected by the size of the growth, since a small polypus will cause just as severe, if not a greater hemorrhage than results from a large tumor.

In submucous growths the menses become profuse and prolonged, resulting in marked anemia and great debility. The bleeding may be continuous and very free for a few days, then there is a period of brown secretion, to be followed again by profuse bleeding. Blood may be discharged as a bright fluid blood or in large clots. Clotting has no significance, and depends upon the size of the uterine cavity in which the accumulation occurs, or it may take place in the vagina. Pedunculated polypi may be associated with severe flooding. Intermenstrual hemorrhage may alternate with periods of amenorrhea, which may continue for months, and when the patient is congratulating herself that she has recovered, another severe hemorrhage occurs. The bleeding occurs from two sources: 1. From the mucosa covering the tumor; 2. from the general uterine surface. The first is active as the tumor encroaches on the mucosa only after it becomes pedunculated. The bleeding comes from and is due to irritation of the circumjacent uterine mucosa and the production of an interstitial endometritis. In some of the smaller growths the tumor will be found quite anemic. Metrorrhagia from rupture of veins in the superimposed mucosa is frequently associated with a profuse watery discharge, which adds to the depression and prevents the patient from regaining her health.

Leukorrhea, or discharge other than blood, is increased during the progress of these growths. The extrusion of the growth into the uterine cavity increases the normal watery discharge from the uterine glands. Interference with the circulation and consequent hypertrophy of the glandular tissue cause a profuse secretion. This may be truly glandular in character and mixed with the desquamated epithelium. Pus-cells and blood-cells also may be found, according to the degenerative processes, which sooner or later ensue. As the cervix becomes dilated, its glands add their thick, viscid secretion to the abundant discharge. The partial or complete extrusion of the growth influences its circulation, frequently causing necrosis of portions of its surface or even the entire structure, according to the extent of the constriction. The discharge is often bloody, purulent, or watery, contains necrotic masses of detritus, and produces an extremely offensive odor. The patient, and not infrequently her attendant, has cause to suspect the existence of malignant disease.

In all varieties of tumor the blood supply of the growth itself is very slight, as no large vessels enter the tumor directly. Where the neoplasm is of some size, this deficient blood supply must affect the nutrition of its structure, and causes the production of toxins which have a deleterious influence upon the health of the individual. This is evident from the appearance of such patients where hemorrhage and leukorrheal discharge are not a factor. It is probable that these toxins have an influence upon the heart muscle and other structures of the body, causing conditions which are so frequently found associated with the presence of a fibroid growth. It is probable that in these toxins will be found the explanation for the mental disturbance that is so frequently associated with the development of such growths and which usually clears up with their removal. It may also explain the occurrence of ascites which frequently is associated with subperitoneal growths.

Pain is not a constant symptom. It is frequently more a sensation of weight or pressure in the pelvis and upon the surrounding organs. Intense pain may characterize very small growths, but is conditioned somewhat upon their situation. A growth pedunculated or so situated upon the uterine wall that it projects into the internal os may act as a ball-valve, and be the cause of the most agonizing labor-like pains. I have seen this form of dysmenorrhea in many cases. (Fig. 493.) In one patient it was so severe as to require the administration of two grains of morphin at each menstrual period to render it endurable. An operation subsequently revealed that the patient had a double vagina and a bicornate uterus with two distinct cervical canals in a common cervix. In one of these cavities was found a submucous tumor which, by a nipple-like projection, filled up the internal os, and explained the violence of the dysmenorrhea from which this patient had suffered.

Sterility is a common symptom and conception is the exception. The inflammatory changes consequent upon the presence of the growth render the reception and retention of the fecundated ovum unpropitious. More frequently than is generally appreciated, the tubes have undergone secondary changes which result in the occlusion of their abdominal extremities, and they are found to form retention cysts. Furthermore, pathologic conditions of the ovaries are sometimes found, and this fact, also, is not given the consideration it merits. Constipation, hemorrhoids, anal fissure, prolapse, and pain arising from pressure upon the rectum are more or less constant symptoms and signs. Vesical tenesmus, cysts, frequent micturition, retention of urine, dilated ureter, and hydronephrosis are produced by disturbance and obstruction of the urinary organs. Not infrequently the first symptom which leads to the discovery of the growth is the retention of urine, from pressure upon the vesical neck. The myomata may also be the cause of retention of urine pressure upon the ureters interfering with the entrance of the secretion into the bladder. As a consequence, renal dilatation occurs even to the extent of sacculation of the kidneys. In one of my early operations for myoma, upon a patient who had carried a large tumor for some twenty years, death followed very shortly after the operation. The autopsy revealed that both kidneys were distended,

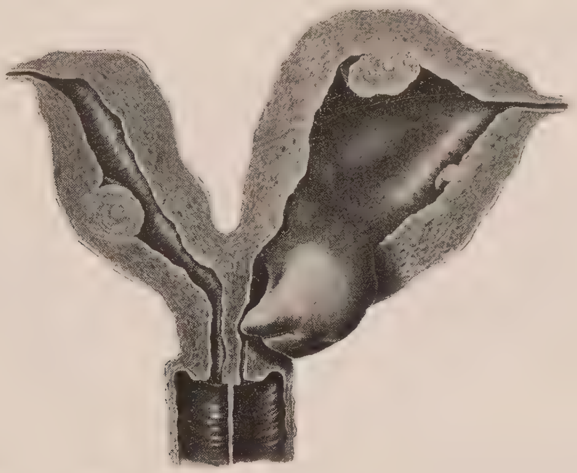


FIG. 493.—Bicornate Uterus. Both Cornua Containing Myomata.

forming thin-walled sacs, that the ureters were several times their normal size, and that their walls had become greatly thinned. The protracted hemorrhages, profuse discharge, severe labor-like pain, and pressure upon the neighboring viscera are prone to result in a profound anemia, which is characterized by a straw-colored appearance of the skin, often so marked as to simulate cachexia and indicate plainly the gravity of the patient's condition.

Diagnosis of Myomata. A uterine fibroid may be suspected when there is a slow but progressive enlargement of the lower part of the abdomen. It may occur in either the single or married woman, and need not be associated with any special indication of ill health. The physician should not overlook the possibility of its existence whenever a patient complains of pelvic weight or pressure, frequent micturition, difficult urination, or sudden attacks of retention necessitating catheterization. Indeed, in all such cases, the pelvic viscera should be examined preliminary or subsequent to the use of the catheter. Uterine growths should be suspected also when hemorrhoids, fissure of the anus, frequent bleeding from the bowel, pain, difficulty, and distress during defecation exist. A patient should never be subjected to operation or treatment for hemorrhoids until the condition of the uterus has been determined. A Sister of Charity requested operation for severe hemorrhoids when pelvic examination revealed a group of subperitoneal and interstitial fibroids completely filling up the pelvis. She had never suspected their existence. Profuse menstrual flow or irregular bloody discharge occurring in the unmarried woman or in women giving no history of interrupted pregnancy, miscarriage, or abortion, should cause suspicion of a submucous fibroid, particularly where this hemorrhage is associated with pain, often labor-like in character, indicating the efforts of the uterus to expel a foreign body. Often the hemorrhage will produce marked anemia without emaciation, which distinguishes it from that associated with malignant disease. No characteristic symptoms of myomata occur, consequently the physician is forced to rely upon the physical signs for diagnosis and confirmation of his suspicions.

An important factor in the recognition of fibroid growths is their consistence in contrast with the surrounding soft structure of the uninvolved portions of the uterus by which their determination and delimitation is permitted. Alterations in the shape of the uterus, in relation to the situation of the tumor are of interest. A large growth may fill out and give the organ a spherical shape. Further uterine contraction forces the tumor into the cervix which may be distended, making it palpable at the external os. An intra-uterine polypus can be determined by palpation through the cervical canal. If the os is sufficiently open, the pedunculation can be inferred by its mobility, and definitely determined by reaching the pedicle with the finger. In small fibroid growths with a long pedicle the growth may be felt through the uterine walls moving under the pressure of the finger, even though the cervix is undilated. During profuse menorrhagia, an offending growth is frequently extruded or the cervical canal sufficiently dilated to permit its recognition by the examining finger. A growth may be extruded during the flow and drawn back in the interval, producing what is known as an intermittent polypus. A growth filling up the pelvis may make pressure upon the large vessels and so interfere with the return circulation of the lower extremities as to cause enlargement of the superficial veins to compensate for the obstructed abdominal vessels. Pressure upon the ureters causes their dilatation, hydronephrosis, dilatation of the pelvis of the kidney, not infrequently sacculation with destruction of its secreting tissue, the formation of renal calculi, and even the occurrence of suppurative changes. These are characterized by more or less renal pain and discomfort which may possibly mask the pelvic lesion. Interference with the cardiac or renal functions causes profound anemia, the appearance of cachexia, not infrequently disturbance of the veins of the lower extremities, phlegmasia, blocking of important vessels by particles of coagulated tissue, and possibly the formation of pulmonary and cerebral emboli. The diagnosis is effected by bimanual examination, the introduction of one or two fingers into the vagina or the finger into the rectum, and the other hand over the abdomen. Thus the uterus is carefully palpated and any enlargement of its structure recognized. If such enlargement or hardening of the organ exists, its size, resistance, and relation are studied carefully. A fibroid growth has a definite shape, is smooth in outline, well defined and has a characteristic resistance. It is important in the study of such a growth to arrive at a diagnosis not only as to its existence, but also as to the form of growth present. It is decided then whether the growth is an intra-uterine or a submucous tumor. When the cervix is patulous, further palpation determines whether the growth is sessile or polypoid. If interstitial growths occupy the uterus, their situation on the anterior or posterior wall or the fundus is determined, or, if subperitoneal, from what portion they spring. The latter growths are divided into three types: 1, the growth from the fundus or anterior wall grows upward, and in its progress becomes pedunculated; 2, it is pushed out through the lateral wall of the uterus practically splitting

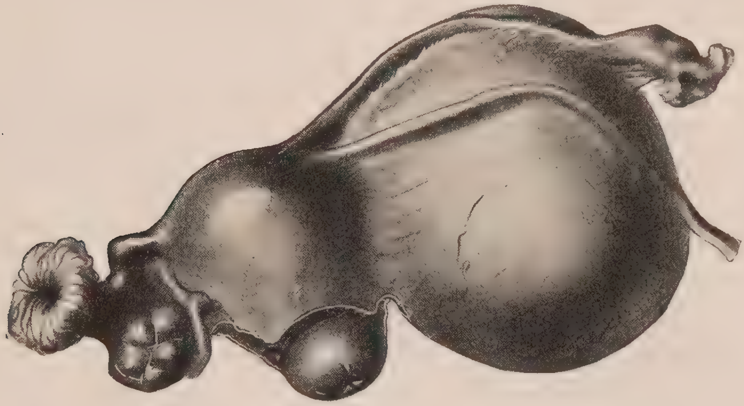


FIG. 494.—Intraligamentary Myoma.

and spreading out the folds of the broad ligament and displaces the uterus to the opposite side (Fig. 494); 3, it grows downward from the posterior wall beneath the peritoneum and is not even in contact with it. In a small tumor as yet nonpedunculated, it may be difficult to determine by conjoined manipulation from which wall it has originated. The intra-uterine use of the sound, or better, dilatation and the use of the finger in the uterus with one hand over the abdomen or a finger in the rectum will establish the diagnosis and the relation of the growths to the uterine wall can be determined accurately by their smooth regular outline. A fibromyoma of the cervix presents a mass in the vagina, often filling it. The mass is quite movable, and between it and the vaginal walls the finger can be passed easily. Its situation external to the cervix precludes the probability of its having undergone necrosis from pressure, but occasionally the pressure may cause inflammation in the vagina, leading to agglutination between the tumor surface and the vaginal wall. The tumor attachment is recognized by bimanual palpation accompanied by traction upon the growth.

306. Differential Diagnosis of Myomata. An accurate diagnosis of any condition is secured only by carefully reviewing the conditions with which it may be confused. The conditions with which myomata are likely to be confounded are:

Normal pregnancy.
Ectopic pregnancy.
Desmoid tumor of abdominal walls.
Inversion.
Carcinoma.
Sarcoma.
Incomplete abortion.
Subinvolution with endometritis.
Uterine displacements.
Ovarian displacements.
Ovarian cysts.
Pelvic infiltrations.
Sactosalpinx.
Floating kidney.

Normal Pregnancy. Amenorrhea, subjective symptoms, regular growth of the uterus, absence of hardness in its walls, and a sensation of elasticity are generally sufficient to determine the diagnosis of pregnancy. A limited amenorrhea may occur in a submucous myoma, and a patient go for months without a hemorrhage. On the other hand, hemorrhage occasionally complicates the early months of pregnancy. I formerly attended a patient who always suspected pregnancy if the menstrual flow was especially free, and she continued to menstruate for two or three months following each conception. Myomata may be present as small, edematous, subperitoneal nodules, which are sometimes mistaken for the extremities of the fetus. Calcification of a fibroid has caused it to be mistaken for the fetal head. The existence of the tumor does not preclude the possibility of pregnancy as a complication. Pregnancy associated with fibroids should be suspected when the growth takes on more rapid enlargement, when the rapidity of the growth is greater than that which usually characterizes the tumor, and when a portion of it gives the sensation of elasticity. The regular shape, size, and outline of the uterus under the bimanual, with the contractions of the pregnant organ, which are absent in the nonpregnant, contrasted with the more or less firm resistance, the irregular enlargement, and the smooth nodular outline of the tumors should establish the diagnosis. In diagnosis the following case very graphically illustrates, as shown in Figs. 504 and 505, that fibroid tumors under certain conditions may simulate pregnancy. The patient, about forty-two years of age, had applied to her physician for relief from an uncomfortable sensation associated with enlargement of the lower abdomen. He pronounced her pregnant, confirmed the diagnosis and later it was coincided in by other physicians. I saw her some time after the normal period of the supposed pregnancy was completed when she was referred to me as a case of delayed labor. Examination disclosed the cervix to be of normal size. However, above, in front of it could be felt distinctly two rounded masses with a sulcus between which led the examiners to take the condition for a fontanelle. The abdomen was enlarged to the size of a pregnancy at six months. There was a sensation of elasticity or rather of distention in the abdomen. A movable mass could be felt which impinged against the abdominal wall when the hand was suddenly removed. This sensation was attributed to ballottement of the fetal body. Bimanual examination, however, convinced me that the mass was extra-uterine. I was confirmed in this by the history, as the woman never ceased to menstruate and the enlargement had increased only to a slight extent in the last few months. Investigation of the case caused me to pronounce it multinodular myomata, one of which had a rather thick pedicle, permitting it to be pushed away, but firm enough to bring it back against the abdominal wall and thus produced the sensation of ballottement. The freedom of movement was accounted for by the presence of free fluid in the peritoneal cavity. Operation confirmed this diagnosis.

Extra-uterine pregnancy will present symptoms in the early stage similar to those of a normal pregnancy, as amenorrhea, nausea, mammary changes, etc., associated with a history of colic-like pains on either side of the pelvis, with later a marked tearing pain, possibly attended by fainting, and symptoms of internal hemorrhage. Subsequently a mass will be found in the side or an increase in the size of the abdomen will take place, but this enlargement will be less symmetrical than is the case in a normal pregnancy. The examination of the patient will ordinarily reveal the uterus slightly enlarged, somewhat softened, free from any irregular or nodular masses, possibly displaced to one side, or crowded forward by a mass which is situated in the side of the pelvis or in Douglas' pouch posterior to the uterus. In the advanced stages the parts of the fetus may be felt, probably with greater ease than if the fetus was contained within the uterus.

Desmoid tumor of the abdominal walls presents the same hardness and

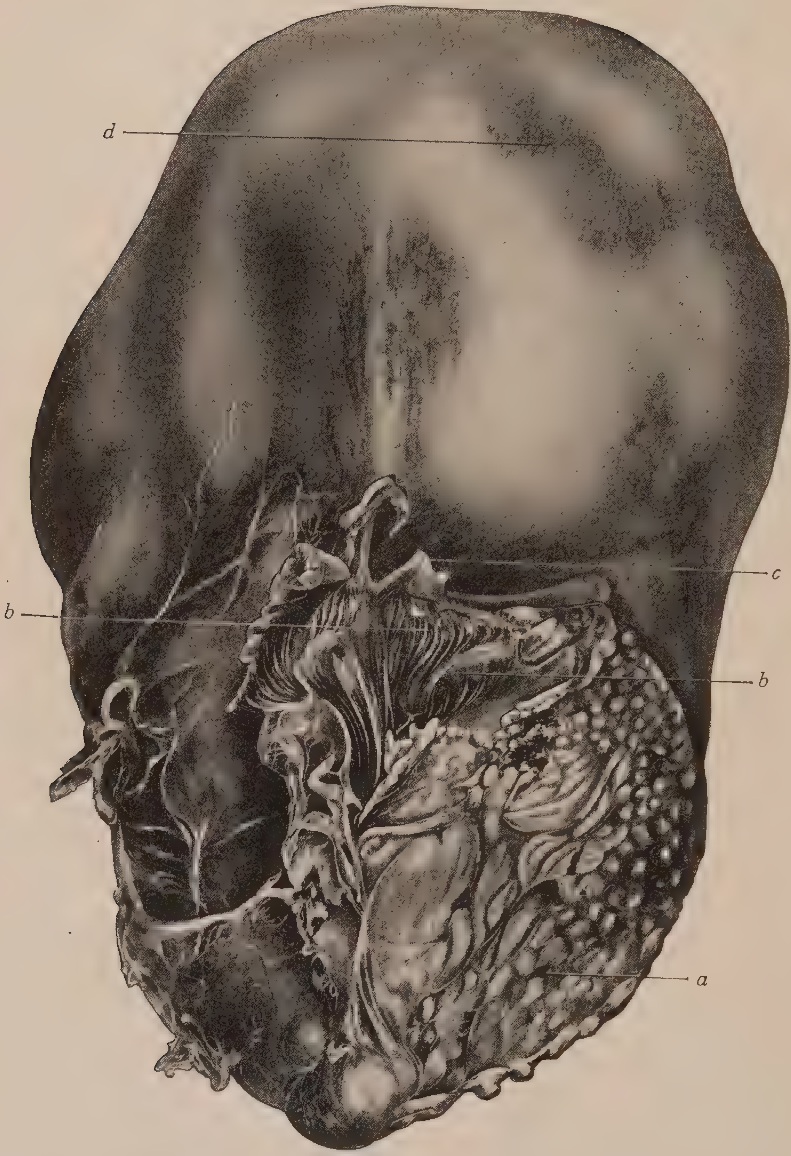


FIG. 495.—Large Desmoid Tumor of Abdominal Wall Weighing, upon Removal, Nineteen and One-half Pounds.

a, Adipose tissue of abdominal wall; *b*, *b*, recti muscles from which tumor originated; *c*, aponeurotic sheath of recti muscles; *d*, portion of tumor projecting downward into pelvic cavity.

resistance as does a fibroid growth of the uterus, but developing in the muscular structure of the abdomen it generally becomes by its weight more or less pendulous and usually does not attain to large size, so is readily distinguished from the deeper seated uterine growths. In my clinic in the spring of 1905 a colored woman of thirty years, who had given birth to two children, presented herself with a distention of the abdomen which was quite symmetrical and extended from the pelvis to beneath the ribs. Palpation disclosed a firm, hard mass, occupying the entire abdomen and quite movable. The diagnosis was made of interstitial uterine myoma and resort made to operation. Incision in the median line, however, exposed the tumor as continuous with the abdominal wall, and did not afford access to the peritoneal cavity until it had been carried some distance above the umbilicus. The growth sprang from the right side of the abdominal wall, was covered upon its inner surface with peritoneum, and had no association with the uterus. (See Fig. 495.) The tumor weighed nineteen pounds. (Fig. 496.) Notwithstanding that this growth grew inward from the under surface of the muscular walls and filled the abdominal cavity, careful bimanual examination should have revealed that it had no connection with the uterus and that the abdominal walls could not be moved over it.

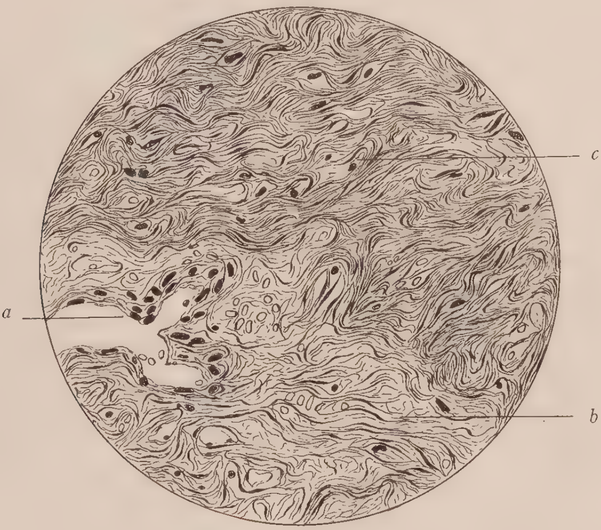


Fig. 496.—Histologic Section of Desmoid Tumor.
a, Blood-vessel; *b*, area of specimen showing edema; *c*, long spindle-shaped cells; note scarcity of nuclei.

Incomplete Abortion. The uterus may be larger than normal and the patient give a history of irregularity and more or less continuous bloody discharge from the uterus. Careful questioning will afford a history of amenorrhea and belief of the patient that she has been pregnant. The uterus will be large and softened. When the cervix is patulous, the finger can be introduced, revealing the enclosed embryonic tissue.

Inversion of the uterus may be associated with a myoma with a short pedicle, attached near to the uterine fundus. The efforts at extrusion of such a mass, after dilatation of the cervical canal, may cause a dragging upon the fundus and gradual inversion. A polypus with a moderately thick pedicle, when extruded from the os, may be distinguished from the body of an inverted uterus with difficulty. A myoma is said to be less sensitive than the uterus, but this is not sufficiently characteristic to be of much value in diagnosis. Upon inspection the inverted uterus shows the orifice of the tube upon either side. In each condition the neck of the uterus can be felt encircling the pedicle of the tumor like a cuff. The diagnosis is best established by introducing a finger into the rectum, while traction is made upon the tumor. The cup-shaped cavity of the inverted uterus will be felt, in case of inversion, where in ordinary cases the uterine fundus should be situated. The exercise of recto-abdominal touch, while traction is made upon the protruding mass, will afford an unfailing method of determining the diagnosis. A sound passed into the uterus in cervical tumor will be found to pass at one side the entire length of the ordinary uterus. In an inversion of the organ the sound will pass an equal distance on all sides of the tumor. However, the diagnosis ordinarily can be accomplished without the use of the sound.

Carcinoma and Sarcoma. Profuse bleeding, pain, and discharge are common both to fibroid tumors and malignant diseases of the uterus. In the majority of cases the offensive discharge associated with malignant disease is not found in myomata. Recognition of this fact has sometimes led to error in judgment. Thus, in a case where a myomatous growth has pushed through the cervix, and for a length of time has been constricted by it, caries or superficial necrosis follows as a result of the interference with the circulation in the tumor, from which the careless observer may be led to a diagnosis of malignant disease. Digital examination of such a patient, however, reveals the fact that the vagina is occupied by a tumor which is firm in consistence, smooth and regular in outline, not friable nor easily broken down, thus differing materially from the friable necrotic mass which is found in the vagina in the cauliflower growth of malignant disease. A sloughing fibroid within the uterine cavity may occasion difficulty in the diagnosis. It causes a thin, watery discharge, which is exceedingly offensive. It may have caused repeated attacks of hemorrhage. The associated loss of blood, with the absorption of the products of decomposition from necrotic tissue, produces a condition of sapremia which is with difficulty differentiated from malignant disease. In such cases, however, diagnosis is determined by dilatation of the uterine canal. The necrotic growth forms a large tumor, one which is more resistant, fragments of which broken away and examined present the regular lamellated structure of a fibroid growth, but nowhere is seen the nesting or collection of epithelial masses surrounded by a connective-tissue stroma pathognomonic of carcinoma nor the homogeneous mass of cellular tissue with an absence of true blood-vessels which characterizes the sarcoma.

Subinvolution with endometritis is a chronic inflammation of the uterine parenchyma, and when it has existed for a length of time, the uterus becomes firm and hard, indistinguishable from the hardness of myomata. The enlargement of the uterus is uniform, involving the cervix as well, while in fibroid growths the enlargement is pronounced only in that part of the uterus which comprises the growth.

Uterine Displacements. Flexions of the uterus are the varieties of uterine displacements most readily confounded with fibroid growths. Indeed, a fibroid growth may be the cause of the displacement. The growth, by its smooth outline and situation, may form such an angle as to cause one to regard it as the fundus uteri. These are the cases in which the sound can be employed successfully to ascertain whether the direction of the uterine canal corresponds to the position of the tumor. The cases are rather few, however, in which the gynecologist cannot locate the fundus uteri accurately and detect the relations of the growth thereto by practising the bimanual examination in association with the vagino-abdominal or recto-abdominal touch. Such an examination will reveal the greater consistence of the growth, its rounded, smooth outline, and the extent of its association with the uterus. In a flexion, when the organ is straightened between the internal and external fingers, the normal outline of the uterus is found restored.

Displacements of the Ovary. The ovary is likely to afford confusion of diagnosis only when it is firmly fixed to the uterus by inflammatory exudate or has become somewhat enlarged. Its situation, the inability to recognize the ovary in any other situation, and its extreme sensitiveness should reveal its true character.

Ovarian Cyst. It is frequently difficult to differentiate between a fibroid tumor with a long pedicle, which has become edematous, and an ovarian cyst of the glandular or dermoid variety. If the cervix is grasped with a double tenaculum, while an assistant, with the hand over the abdomen, draws up the tumor, rectal examination affords a more exact determination of the relation of the tumor pedicle to the uterus. Such an examination, under anesthesia, generally will be more satisfactory. The existence of a fibroid tumor does not preclude the possibility of pregnancy. Some years ago I narrowly escaped operating on a patient who gave a history of profuse bleeding three weeks previously. On the right side of the uterus was a firm, hard growth recognized as a fibroid. The left side of the abdomen elasticity or indistinct fluctuation was supposed to indicate an areolar glandular growth closely adherent to a uterine fibroid. When I came to cleanse the vagina a fetal foot and leg were projecting from a dilated os and I delivered a partly macerated fetus. After the placenta was removed, the uterus contracted and a fist-sized fibroid was disclosed on the right. The patient recovered, and the fibroid growth decreased in size during the process of involution, rendering its removal unnecessary.

Pelvic infiltrations are recognized by the previous history of inflammation and the irregular and undefined outline of pelvic exudate.

Sactosalpinx usually is preceded by a history of inflammation. The mass is felt at one side of, or posterior to, the uterus. When adherent to the latter, the connection is so irregular and undefined as to reveal its character.

Floating kidney forms a tumor at a higher level than that at which fibroids usually are found. The fingers can separate it from the symphysis and promontory of the sacrum, and both can be palpated. This procedure would be impossible in a uterine growth. The floating kidney generally can be pushed back to its normal position.

307. Alterations and Degenerations. During the active development of a myoma it becomes larger, swollen, and more edematous with each menstrual period. As the flow ceases, the growth decreases in size and becomes more firm and resistant. In the submucous and interstitial varieties cessation of menstruation or the climacteric is delayed from five to ten years longer than would occur in a woman who was free from uterine disease. With the menopause, however, the growth usually diminishes in size and undergoes a process of atrophy. The tumor becomes firm and hard and its size remains fixed. Or, it may become soft, and, with this, a process of metabolism occurs in which it gradually disappears. Small growths have disappeared almost entirely after the climacteric. Such

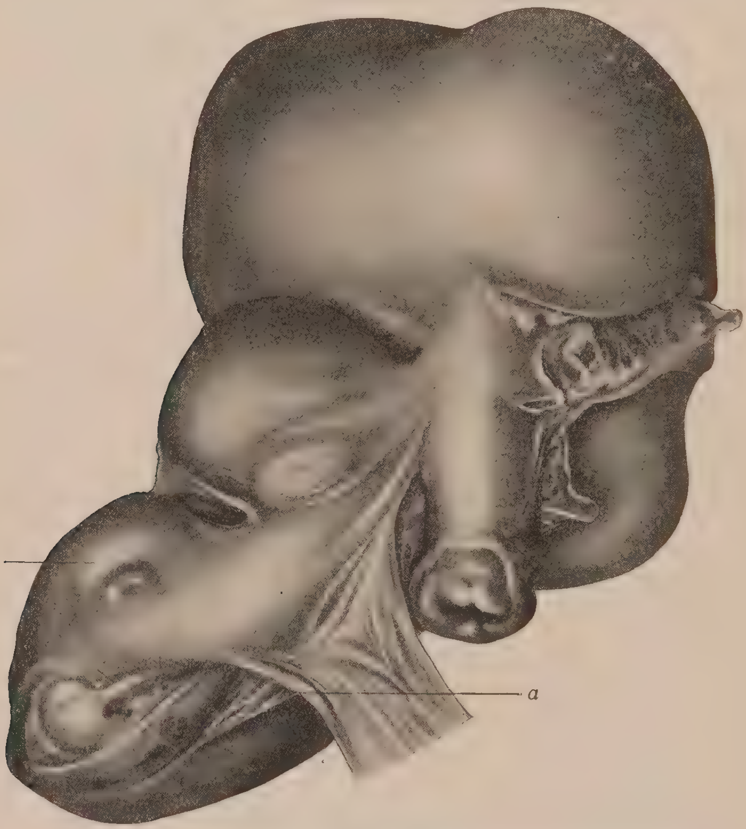


FIG. 497.—Myoma Uteri with Large Intraligamentary Fibromata. *a*, Anterior and posterior leaflets of broad ligament; *b*, tumor.

changes also occur occasionally during a pregnancy or in nonpuerperal cases without assignable cause. Frequently a patient has been greatly disturbed by the knowledge, obtained through examination, of a fibroid growth in her uterus. Months or years later another investigation reveals no indication of its existence. If the second examination be made by another physician, he may be inclined to believe that the condition has been misrepresented, and do great injustice in expressing such a suspicion.

Edema of large fibroids, especially of the interstitial variety, is not infrequent. Edema is caused by constriction or torsion of the pedicle, through which the venous circulation is obstructed, while the arteries continue to pump in the blood. The obstructed circulation in such growths may result in edema as a first stage of a necrobiosis. The interstices of the tumor become filled with serous fluid, so that the enlarged growth affords a sensation of indistinct fluctuation or elasticity, so marked that only the recognition of the continuation of the growth with the cervix renders one able to differentiate it from an areolar glandular ovarian cyst. After the removal of such a growth an incision into its wall will permit the discharge of a large quantity of serous fluid. I once extirpated the uterus for such a growth, when an eminent surgeon examining it asserted that it was a fibrocystic tumor. An incision through the structure, however,

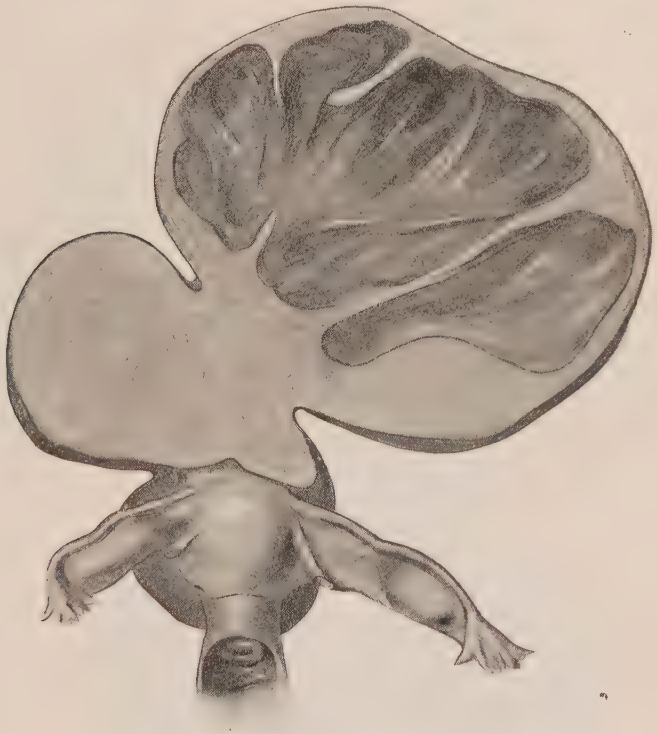


FIG. 498.—Fibrocystic Tumor of the Uterus.

failed to reveal a single cyst, while nearly a gallon of fluid drained out of the growth in the two hours following its removal and incision.

Fibrocystic tumors (Fig. 498) result from dilatation of the lymph-spaces in the tumor, from degeneration of a portion of its structure and the formation of a cavity, or possibly, in rare cases, from the separation of the structure of the tumor in edema.

Calcification. As the tumor matures its direct circulation is reduced and nutrition reaches its structures largely by transudation. Under certain unknown chemical conditions of the blood this fluid is heavily charged with lime salts which are deposited within and upon the surface of the tumor, causing it to become enveloped in a stony shell or to form a calcareous mass. Lime salts were formerly administered to favor such formation and thus arrest further growth in myomatous tumors, but it was soon recognized that other and more vital tissues of the body were equally vulnerable to such deposits. In the examination of growths which have undergone such change, the sensation given of pressure against bone renders such a tumor harder and more resistant than the ordinary mature fibroids. Not infrequently plates of bone will be felt to break beneath the palpating finger. Undoubtedly the cases reported of the expulsion of uterine calculi were myomata which had undergone this calcareous change. A submucous or interstitial fibroid so changed may subsequently be expelled by the uterine contractions. Amyloid degeneration has been reported in one patient. Fatty degeneration has been evident from the macroscopic appearance of tumors I have removed, although it has been asserted that fatty degeneration of such growths is never confirmed by the microscope.

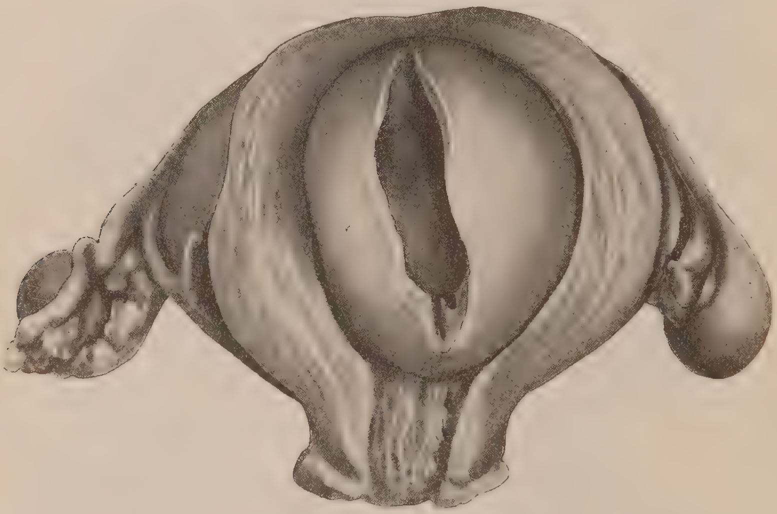


FIG. 499.—Submucous Fibromyoma Undergoing Cystic Change.

Colloid myxomatous degeneration, according to Virchow, is an effusion of mucous fluid between the muscular bands. The presence of a mucin, proliferation of the nuclei and small round cells permits of its being distinguished from simple edema.

Inflammation, Suppuration, and Gangrene. Inflammation of a growth may result from injury, traumatism, compression or obliteration of its nutritive vessels and from septic infection following an exploration. Septic inflammation may follow exploration or delivery. The rapid changes which take place subsequent to the delivery of a patient carrying a large fibroid may cause interference with its nutrition and result in inflammation and suppuration. Suppuration may occur external to the capsule, in the cellular tissue about it, or in the tumor structure. . Suppuration may have been preceded by mortification of a small part of an interstitial or submucous growth. The gangrenous portions may be eliminated spontaneously, or, retained, cause putrid infection. When a large growth is retained after having lost its vitility, it may disintegrate gradually, slough, and be expelled through the cervix into the vagina as a large sloughing mass, or cause such marked symptoms from putrid infection that the life of the patient will be lost, regardless of operative interference.

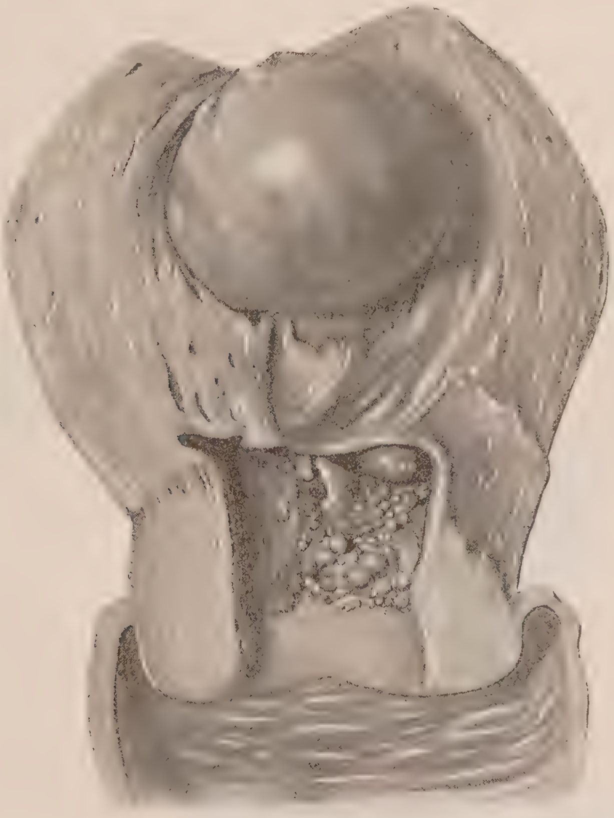


FIG. 500.—Myoma of the Body and Cancer of the Cervix.

Such conditions are mistaken for malignant disease. Some years ago I saw a patient whose physician, after an examination, assured her family that she was suffering from an incurable malignant growth, which must terminate her life speedily. The history of profuse hemorrhage; of an exceedingly offensive discharge; the appearance of profound anemia and a condition resembling cachexia, afforded apparent confirmation of the correctness of his suspicion. The finger disclosed a large mass filling the vagina, which, instead of being soft and friable, as a cauliflower growth would be, was roughened on its inferior, but smooth upon its upper, surface, was quite movable, and supported by a distinct pedicle, which projected from the cervical canal. The neck of the uterus was thin, pliable, and without infiltration, which demonstrated that the diagnosis of malignant disease was incorrect, and that the patient was suffering from a fibroid polypus whose surface was necrotic. In cases of doubt the history, more or less firmness of the growth, distinct arrangement of the structure, even when gangrenous, and absence of any cellular infiltrate are sufficient to afford a correct diagnosis. An abscess may develop either in the wall or within the growth itself.

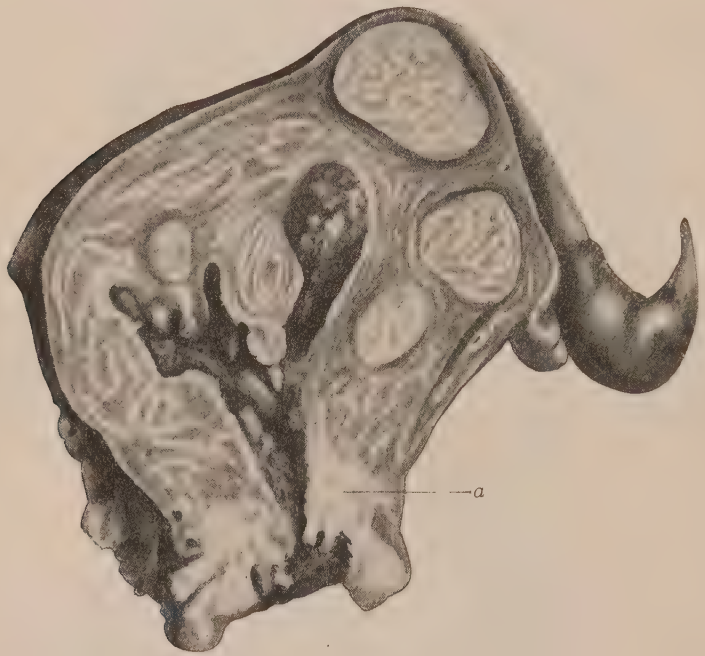


Fig. 501.—Uterus Incised, Displaying Numerous Fibromyomatous Growths and Incipient Cancer of the Cervix.

a, Shows invasion of cervix by cancer.

Malignant Degeneration (Fig. 500). Cancerous degeneration of a fibroid growth has not been demonstrated, nor is it easy to understand how it could occur, unless the growth contains glandular tissue and is, consequently, a fibroid adenoma. A growth within the uterus renders it less resistant and promotes the probability of malignant degeneration of the endometrium. The most frequent malignant degeneration, however, is infiltration of the fibroid growth by sarcomatous processes.

308. Mixed Growths.—Enchondroma, Sarcoma, Osteoma, and Carcinoma. The origin of these growths is uncertain. It is possible that they originate in one of two ways—either in transformation of the cells which produce other tissue species, or in an invasion in which the growth is penetrated by the neighboring proliferating masses. Thus, we have myochondroma, myosarcoma, and myocarcinoma. The first of these is very rare. The second is less rare, and grows rapidly from a small invasion. The normal filamentous structure of the fibroid growth is soon lost in a homogeneous mass, which rapidly becomes necrotic; the tumor then forms a mere thick shell. Vessels are often eroded with the necrosis of the mass and extensive hemorrhage may occur into the cavity. Malignant degeneration is not confined to the growth, but invades the surrounding healthy tissues. The enveloping cells are large, irregular, rich in chromatin, and contain several nuclei. Sänger asserts that all myomatous growths containing irritation cells are sarcomatous.

Myocarcinoma arises from carcinomatous alteration of the surface of the polypus, or by development from the glandular constituents of an infiltrated adenomyoma.

309. Complications. The progress of a fibroid growth from its origin in the wall of the uterus to its subsequent extrusion, and the changes and lesions to which it may be readily subjected, will afford reasonable explanation for the many complications which are associated with it and influence its progress. The most important, because one of the most frequent, of these complications is that of inflammation.

1. *Inflammation* may involve the structure of the growth or only its superficial surface. It affects the growth as the result of decreased nutrition after its extrusion into the peritoneal cavity, when it becomes a foreign body. Nature in her efforts to protect the body tissue surrounds it with plastic material, from which the tumor may receive additional and necessary nutrition, fixing it in relation to the structures immediately about it. Such adhesions may involve the intestine, the mesentery, or the abdominal wall, and may lead, through traction upon the tumor, to still further thinning or attenuation of its pedicle, and, finally, to separation from the body of the organ, so that occasionally such growths are parasites removed from their original attachment and nourished through inflammatory adhesions. The causes for inflammatory changes may be divided into—1, those incident to alterations in the tumor; 2, irritation changes in the peritoneum from the presence of the growth as a foreign body; 3, infection. Infection may have its origin in disease of the appendix, the Fallopian tubes, or through direct transmission from the intestinal cavity.

2. *Ascites* is a second, though less frequent, complication of myomata. (Fig. 504.) This is attributed to irritation of the peritoneum from pedunculated subperitoneal growths. (Fig. 505.) It is more probable that it

is the result of a toxin from the lowered vitality of the growth. Ascites is more frequent in malignant than in benign growths, and its presence should always awaken the fear that grave changes are taking place in the growth.

3. *Disease of the Tubes* (Fig. 502). Disease of the Fallopian tubes as a complication of the presence of fibroid tumors is very common. The disorder may be a simple hydrosalpinx or a pyosalpinx. Adhesions may be extensive, greatly complicating any operative procedure. The most frequent cause of adhesions is undoubtedly infection which has traveled through the uterus. The presence of fibroid growths favors congestion of the pelvis, and makes the tubal mucous membrane a favorable soil. Pressure upon a Fallopian tube may interfere with its circulation, cause a distention of its cavity, and the formation of a tubal collection. This defective drainage produces regurgitation into the pelvic peritoneum from the abdominal end of the tube; a peritoneal inflammation; a closure of the tube and the formation of a hydrosalpinx or pyosalpinx, according to the exposure to or absence of infection.

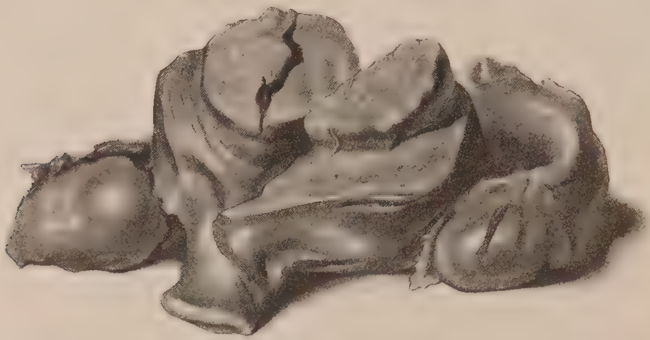


FIG. 502.—Myoma Uteri Complicated by Pyosalpinx.

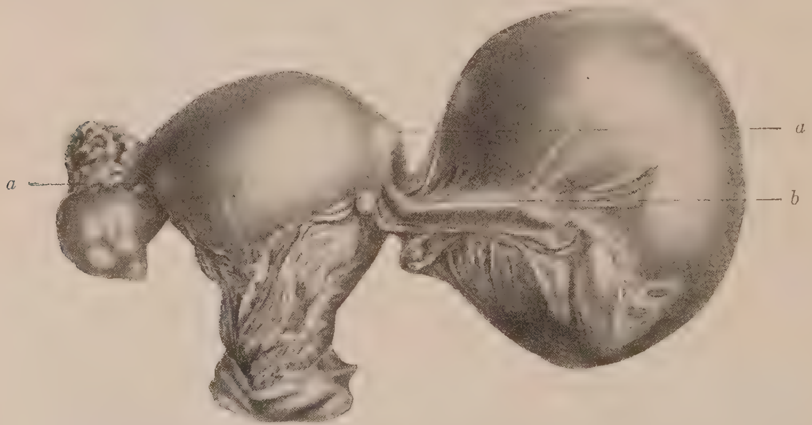


FIG. 503.—Uterus Containing Several Fibroid Tumors Complicated by a Large Tubo-ovarian Cyst. *a*, *a*, Shows sites of fibromata; *b*, round ligament.

4. *Ovarian Hematoma.* The distention of an ovary by the accumulation of blood is no unusual complication of myomata. The ovarian sac usually is adherent and filled with a thin, dark, bloody colored fluid. The sac wall is easily broken and is rarely removed without rupture.

5. *Pregnancy.* The presence of fibroid growths is a cause of sterility, but does not necessarily preclude the occurrence of pregnancy. The early recognition of the complication is of the utmost importance, as the course of pregnancy may have a marked influence upon the rapidity of the growth, while the growth may favor the premature arrest of pregnancy. This complication is of such importance that it may be studied from various standpoints.

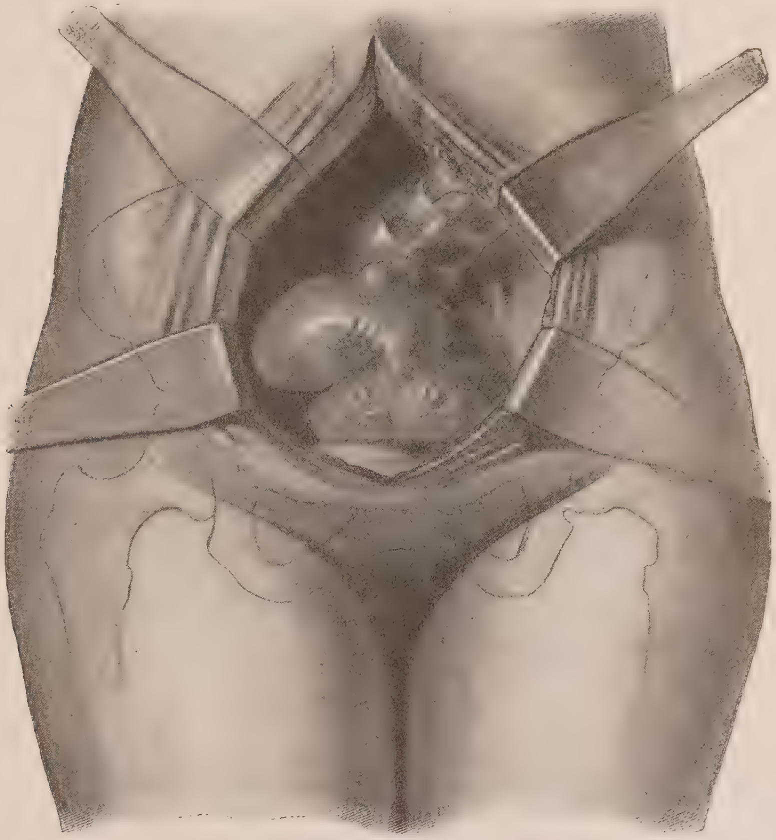


FIG. 504.—A Myoma Which, from the Associated Ascites, Had Been Mistaken for Pregnancy.

a. The Influence of the Myoma upon Conception. It can be appreciated readily that a fibroid growth—for instance, of the polypoid or submucous variety—renders the uterine mucosa unprepared for the retention of the fecundated ovum. Frequently the removal of a polypus from a woman is followed very shortly by conception, even though years of sterility had preceded. The engorgement of the uterine mucosa, occasioned by the presence of a sessile submucous or of an interstitial growth, encroaching on the uterine canal, the profuse and irregular hemorrhages associated with it and the constant and excessive secretion from the glandular structure, present conditions exceedingly unfavorable for the fecundation of the ovum.

b. Influence of Pregnancy upon the Myoma. The increased congestion of the uterus incident to pregnancy causes greater nutrition of the tumor, often results in its rapid increase in size, and the growth which was situated in the pelvis is raised out of it forming a more formidable mass. Occasionally the growth is slow, adhesions so fix the uterus that it cannot rise out of the pelvis, and there follows an impaction similar to that in a gravid retroflexed uterus. Sometimes the tumor rises quickly into the abdomen, or it may remain in the pelvis, and not emerge therefrom until the sixth or seventh month. Intraligamentary growths become altered by pressure and cause marked distress. A fibroid polypus is sometimes extruded into the vagina and removed without any indication of interference with the pregnancy. Marked changes in size, form, and consistence of the uterine growth are noticed. The increase in size is often due to edema. Venous engorgement frequently occurs as a result of obstruction of the veins, while the blood is continually poured into the structure by the less readily controlled arteries. (Fig. 505.) Where a number of fibroid growths are situated together in the pelvis, they frequently become nonpedunculated subserous growths, flattened from pressure. The circulation can be obstructed to such a degree as to result in necrosis. Such changes require early and prompt interference in order to save the life of the patient.

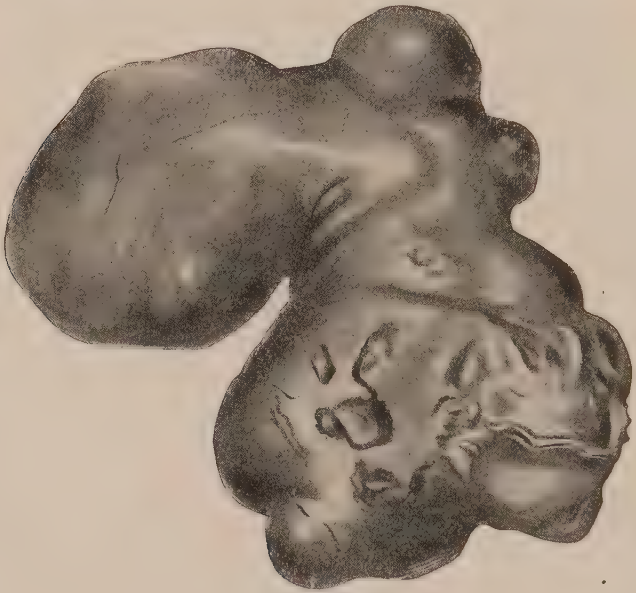


Fig. 505.—Tumor Shown after Removal.

c. The Influence of the Myoma upon Pregnancy.—An intra-uterine growth, covered as it is by mucous membrane, aggravates the tendency to bleeding. Hemorrhage and changes in the uterine mucosa may be so marked as to cause premature interruption of pregnancy; or the ovum may be situated so low in the uterine cavity as to cause the attachment of the placenta over the cervix. This is known as *placenta prævia* and the mother's life is endangered by it as the pregnancy advances. The situation of the tumor may favor retroversion of the gravid uterus and its impaction in the pelvis, or the tumor itself may be impacted. The pressure of a fibroid growth upon the tubes may favor tubal pregnancy, which will be unsuspected until it ruptures into the abdominal cavity and the patient's life is imperilled.

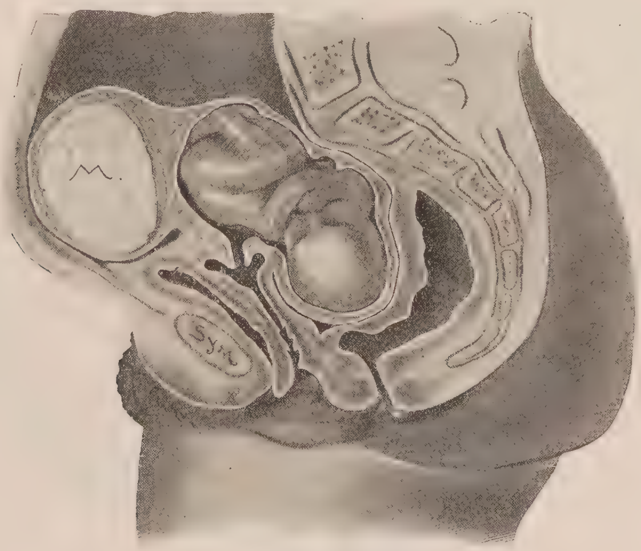


FIG. 506.—Myoma Complicated by Pregnancy.

d. Influence upon Labor. Small fibroid growths, especially those which are not larger than a walnut or an orange have but slight influence, if any, upon the course of labor. Larger tumors, situated in the pelvis, may interfere with labor and require operation for their previous removal. Occasionally, with the changed position of the patient and elevation of the hips, the tumor may be pressed out of the pelvis; or, one situated low in the uterus, under dilatation of the os and elevation of the cervix as the dilatation progresses, may be lifted out of the way. Interstitial and broad-based subserous growths cause irregular and ineffective uterine contractions which prolong the labor. The existence of myomata has been found to complicate the results greatly. Experience has demonstrated that labor complicated with myomata in the cervix is provocative of a greater maternal mortality than is associated with contracted pelvis. The infant mortality is still more serious.

Large subserous growths, when above the pelvis, in or near the fundus of the uterus, exert no influence upon the progress of labor. Cervical growths, however, are very important, as from their situation they may occupy a position below the level of the pelvic brim, and necessarily interfere with the delivery of the fetus. Even when a growth is found in the pelvis thus, it is often raised spontaneously as the process of dilatation proceeds. Submucous growths may be extruded into the vagina previous to the inception of labor and then be removed. If the tumor becomes edematous, it is more compressible and less of an obstacle to the progress of delivery.

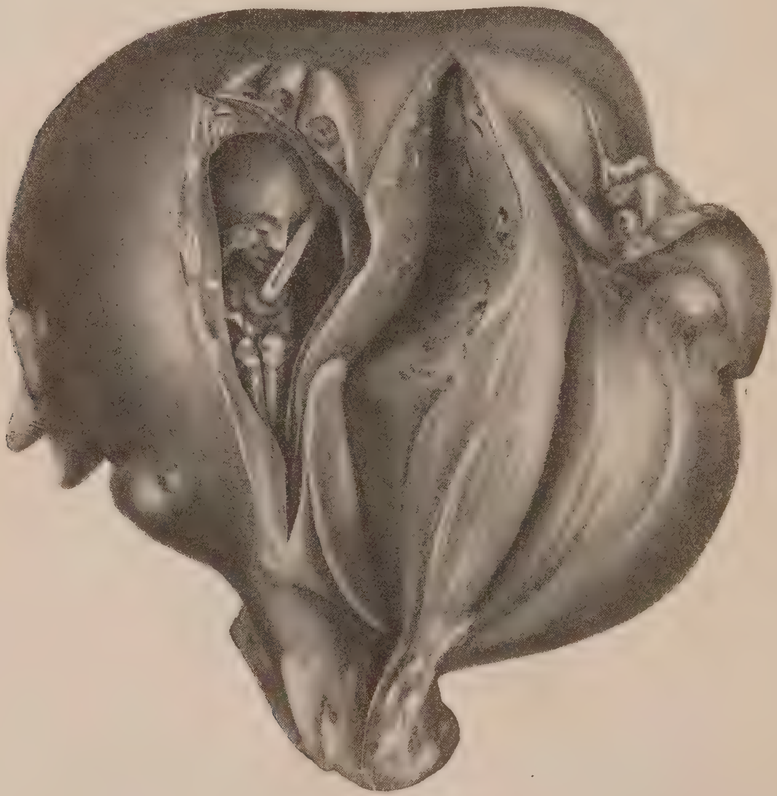


FIG. 507.—Uterus Containing Large Fibroid Tumor and Three Months' Fetus.

Course and Prognosis. Myomata, when small, produce few symptoms, if any, and those are vague. Some cause serious disturbance until the occurrence of the menopause, when the great majority of them undergo atrophy and diminish by induration during the process of involution. Atrophy is hastened occasionally by pregnancy, so that patients in whom a fibroid growth has been recognized lose the tumor entirely during pregnancy or when it terminates. When it outlasts the term, it disappears during the puerperium. Occasionally there is a marked effect on the general health, associated with fibrous cysts of fibromyomata—particularly after the critical age. A tumor that remains quiescent is not necessarily small, but may reach to the level of the navel before the patient is aware of its existence, when examination is made for some intercurrent condition, or for the treatment of symptoms produced by the tumor, the cause of which the patient had ignored. In the majority of cases, the tumor does not threaten life directly nor indirectly. In this respect it differs from carcinoma or ovarian tumor. Carcinoma demands operation as soon as discovered, for life is destroyed by its progress; in myomata the need is less imperative for the growth may bear no relation to the disease for which relief is sought. In myomata of large size, extending above the umbilicus, the prognosis is good in young individuals, but the future health of the patient is endangered. In a woman still under thirty-five years of age with a tumor as large as a pregnancy at full term, one can assert with security that her life is threatened, and her capacity for suffering is limited. Operation is no longer elective, but necessary, as the danger from the operation is less serious than the unfavorable influence produced by the growth of the tumor. In such cases the physician is justified in asserting that the operation is advisable, and cannot be postponed for ten or twenty years with the hope that the patient will still manifest good powers of resistance and a fair chance for recovery. When the tumor comes under observation near middle life in the fifth decade —about forty-three to forty-five years of age—advice must be governed by the symptoms. However, the degenerative processes and complications which may occur are more dangerous than the removal would be. A tumor which swells during menstruation may undergo considerable diminution during the climacteric, and when under observation may be permitted to continue unless symptoms develop. In all cases the prognosis depends upon the age of the patient. Great size of the tumor and complex symptoms affect the future course. All complications that increase the size of the tumor render the prognosis worse in a younger patient. In such cases the operator must be influenced in his action by the progress. Complications that may be regarded as hazardous in the young, are less serious in the older because the longer duration of the disease renders the organism more resistant. Prognosis is bad in cases of severe heart lesions, as fatty degeneration, though this is difficult to recognize in the living. Other complications may render the prognosis of the myomata bad, but not necessarily make the outlook for operation worse. The first indication of heart affection should be regarded as an indication for prompt operation. The prognosis is rendered much worse if the myoma has undergone a malignant degeneration, which, however, is rare. Rapid growth of the tumor is not necessarily an indication of malignant change, but rather of cystic degeneration, which renders the prognosis of the further continuation of the growth worse, approaching in this respect the ovarian condition. The prognosis of all small tumors, especially those which cause more or less hemorrhage, is not always unfavorable. The danger is never so great as it appears to the patient. The discomfort produced by the condition, anxiety about further duration, and increase of bleeding impel the patient to consult her physician. In such cases it is difficult to arrive at a correct judgment, as the patients do not appreciate the fact that life is not necessarily threatened when menorrhagia is profuse. In the consideration of methods of treatment the fact must be kept in mind that the productive activity is injured, even though a bad prognosis is not to be asserted. The danger lies in the long duration of hemorrhage, which thereby renders the general condition worse. The gravity of the prognosis is increased by marked general disturbance. The appearance of hemorrhage cannot always be regarded as unfavorable. It proves that the spontaneous discharge of the tumor is taking place, following which the prognosis is improved.

While it is true that a fibroid growth usually undergoes an abatement of its symptoms with the advent of the menopause, it is not unusual for such a growth to delay the climacteric beyond the ordinary period of life at which it would occur. Occasionally, the natural evolution of a tumor, which results in its conversion into an extraperitoneal or intraperitoneal growth, may cause separation from the weight of the tumor alone or from thinning of its pedicle. By straining in defecation or in vomiting, a polypus may be expelled. Rupture of a pedicle may limit the subsequent progress of the growth. It may be nourished by the adhesions it has formed, or it may lie free in the peritoneum and undergo mummification. A more serious result of spontaneous extrusion is mortification or gangrene of a tumor which has been expelled into the uterine cavity. Perforation of the neighboring organs, such as the bladder, the rectum, the rectovaginal pouch, or the abdominal wall may occur as the tumor develops. Frequently the two former conditions end in death; the latter in possible recovery. Causes of death are profound anemia from repeated hemorrhage; successive attacks of chronic peritonitis; disease of the kidneys; uremia and heart failure; rupture of cyst; or inflammation and gangrene. Sudden death has been observed as a result of embolism. Exploratory puncture favors the production of thrombi in the large venous sinuses. Death from shock after intravenous rupture has been reported. Where there are small subperitoneal growths which have been extruded beneath the peritoneum, and by their relations show no evidence of taking on growth, it is preferable that the patient should be left unaware of their existence. The various complications to which these growths are subject; the alterations which they may undergo during their progress; the influence upon the health of the individual from pressure upon important viscera; the danger from separation of growths and subsequent gangrene; the possibility of their continued nutrition and growth subsequent to the menopause; and the occasional malignant degeneration of the mass, associated with the diminished mortality by early operative procedure, particularly that of hysterectomy, render it advisable that the extirpation of the growth should be practised. In the young the possibility of the occurrence of pregnancy with its attendant dangers is an important factor, and one which may be an indication for treatment. When a woman suffers from a condition which insures a maternal and infantile mortality it becomes a serious question whether she should be advised to marry, or, if married, should not be subjected to prompt operative interference.

310. Treatment. The mere recognition of a myoma must not be considered as a necessary indication for its removal, or even treatment. In this respect myomatous tumors differ from ovarian and malignant growths. The latter especially must be removed early, for its continued existence results in destructive invasion of the organism. The myoma must cause symptoms in order to indicate interference. The external relations of the patient must play a great rôle in the method of treatment —the capacity of resistance, the ability to undergo rest during menstruation, and to avoid severe bodily labor. Consequently in women of the working class, who cannot rest, the treatment is different from that which must be practised in those who are able to take care of themselves. There are some cases in which hygienic and dietetic rules must govern. Neither the growth of the tumor nor the severity of the hemorrhage will necessarily be influenced by the methods of treatment; but by the avoidance of severe bodily effort and the promotion of nutrition disturbance of the health equilibrium is avoided.

The patient should be cautioned as to her manner of dress, and advised to wear loose clothing, since it is exceedingly detrimental to crowd a myomatous uterus into the pelvis by wearing a tight corset. Tight clothing over an abdomen containing such growths may readily produce inflammation which will lead to extensive and unfortunate adhesions. When the abdominal wall has become greatly weakened by previous distention or the weight of a large tumor following the climacteric, the comfort of the patient may be greatly enhanced by wearing a binder or support which will prevent the tumor from falling forward. In such cases and in growths inclined to torsion, a radical operation is indicated. Schröder attempted to fasten movable tumors by sutures through the abdominal wall. Such a procedure is not only unsatisfactory, but dangerous. The profuse hemorrhages which frequently occur require that the nutrition should be carefully maintained and that all excesses of Bacchus and venery should be avoided. Preceding and during the menstrual period the patient should be kept in bed and an ice-bladder or cold applications should be placed over the abdomen. Tea and coffee should be interdicted, because experiments have demonstrated that both these beverages increase the hemorrhage. Various baths and mineral waters have been advocated as especially efficacious. Among these are the Kreuznach, Tolz, and Halle, in upper Austria, which are largely impregnated with iodin and bromin, and the Franzensbad and Elster, in which sulphur is an important element. These waters probably exert their influence, not so much by their direct effect upon the tumor, as by the improvement of general nutrition. The health is built up, complete rest secured, the appetite improved, and more or less relief is obtained.

Treatment may be:
Medical.
Electrical.
Surgical.

Medical treatment should consist in the employment of remedies and hygienic measures directed to promote the general nutrition of the patient and to ameliorate the unpleasant symptoms. Such treatment must be largely symptomatic. The list of remedies advocated for the treatment of uterine myomata is extensive; but, as usual, the larger the list of remedial agents, the less beneficial the influence exerted. Notwithstanding the effective results attributed to many different remedies, the history of myomatous growths discloses that normally they undergo peculiar changes, becoming sometimes larger and at others smaller. Occasionally the growth disappears without any assignable cause. Such fortunate results have added to the reputation of certain remedies, when, had they not been administered, a similar cure would probably have occurred.

The agents most likely to exert an influence upon the progress of the growth are those which produce an effect upon the muscular coat of the organ, and belong to that class known as oxytocics, of which ergot is the principal. Ergot may be administered by the stomach, by the rectum, or by hypodermic injection. By the stomach it causes more or less disturbance of the digestive tract, nausea, and vomiting. Moreover, in order to secure any beneficial effect it must be continued over a long period of time, which renders this method of administration objectionable. Ergot in combination with a vegetable astringent will sometimes exert a favorable influence in decreasing and arresting a severe hemorrhage. It may be employed in the following combinations:

℞. Ext. ergot., ... f℥j
Extract. hamamelis,
Tinct. cinnamon., ...āā f℥ss. M.
Sig.—fʒj every two or three hours

Or:

℞. Ergotin, ... gr. ij
Hydrastinin. hydrochlorat., ... gr. ¼ M.
Ft. capsulæ No. xxx.
Sig.—A capsule to be taken every three or four hours.

The fluidextract of cotton-root or an extract of ustilago maidis, the ergot of corn, acts similarly though less effective than ergot. When a patient suffers from expulsive efforts of the uterus, these may be ameliorated by the addition of extract of cannabis indica, gr. 1/4 to each dose. Ergot is most effective when administered by hypodermic injection, using either the sterilized fluidextract, the normal liquid, ergotin, or ergone. The agent should be thoroughly aseptic, should be injected in close proximity to the tumor, preferably in the abdominal walls, and the caution should be taken to make the injections deeply into the muscle, since they will then be less likely to cause abscess. Ergot acts in two ways: by stimulating the muscular coats of the blood-vessels, thus cutting off the supply of blood sent into the uterus; and, secondly, by increasing the activity of the muscular structure of the organ. Fibroid growths situated in the uterine wall are, by its influence, more readily expelled, either intraperitoneally or extraperitoneally. To be efficacious, the drug must be continued over a long period of time. When thus employed, it exerts an influence upon the muscular coat of the blood-vessels throughout the body, increases the danger of arterial sclerosis and the establishment of pathologic processes more serious than those for which the drug was administered. Among some of the other drugs having a reputation for producing alterations in retrogressive fibroids may be named the potassium and ammonium salts, particularly the bromid, the iodid of potassium, and the chlorid of ammonium. How much influence any of these drugs exert upon the progress of the disease is an undetermined question. Among other drugs that have been used are sulphuric and gallic acids, turpentine, cannabis indica, extract of hamamelis, extract of hydrastis canadensis, and the active principles of the latter, hydrastin and hydrastinin. While the latter agents exert a favorable influence by constringing the blood-vessels, and thus serve to control hemorrhage, this can be accomplished better by the administration of cotarnin hydrochlorat gr. j every three hours. Efforts have been made to bring about the absorption or destruction of fibroid tumors to compensate for the deprivation of certain nutrient elements which enter largely into the composition of the growth. A diet composed of the carbohydrates seems to have been in some few cases effective. Sir J. Y. Simpson, recognizing that the calcareous degeneration of a fibroid limited its further growth, purposed to accomplish this phenomenon by the administration of large doses of chlorid of calcium, but he soon found that this drug produced calcareous plates in the aorta and in the valves of the heart, and thus caused a graver condition than that for which it was given. In recent years the extract of thyroid gland has been advocated to reduce the size of growths and assist in the arrest of hemorrhage. As patients vary to a great degree in their susceptibility to the influence of this agent, it must, therefore, be employed carefully, increasing the dose gradually from one to three grains a day to the largest amount the sensibility of the patient will permit. In exophthalmic goiter, or in irritable conditions of the heart, the drug is badly borne, even in small doses. In some cases of fibroid growths I have found that the drug produced such an effect upon the nervous system that its use had to be discontinued. Bringing into action, as it does, the active principle of one of the internal secretions, it exerts an influence upon the lining structures of the uterus and thus is beneficial in lessening the tendency to hemorrhage. Polk and Mann claim to have seen pronounced effects from this drug in the diminution of the size of the tumor, but that it has any permanent influence is questionable. Hemorrhage may be lessened and opportunity given for coagulation of the blood in the uterine sinuses by reducing vascular tension, by the administration of glonoin and the nitrites. Probably the extract of the suprarenal gland or its active principle, adrenalin, is more effective than any other agent mentioned in stimulating the muscular coat of the blood-vessels, thus lessening the tendency to hemorrhage. Various local measures such as injections into the vagina, have been employed. These, however, can have no influence on hemorrhage from the uterus, as the coagulation of the blood in the vagina will be insufficient to afford any obstruction to severe uterine hemorrhage. Ice-water was formerly employed, later hot water. Both agents are efficacious in the field of obstetrics, but they have little influence upon fibroid tumors. The agent must come directly in contact with the affected endometrium to be of service. When hemorrhage is marked and uncontrollable by drugs and threatens the life of the patient, the vagina or even the uterine cavity should be packed with iodoform gauze, which acts as a tampon and thus controls the bleeding. When the uterine canal is opened, its cavity may be irrigated with hot water or vinegar and water, or a solution of perchlorid of iron, tincture of iodin, or other agents for the purpose of arresting hemorrhage. Sometimes these are quite effective for a length of time, but their use is not unattended with danger. The uterine canal should be so patulous that the subsequent drainage can be complete, but even in such cases the method of treatment is frequently attended with danger. I remember well a patient in my early experience who had a large fibroid tumor, which occasioned frequent attacks of profuse bleeding. The cervical cavity was quite patulous, and with a uterine syringe I injected tincture of iodin into its cavity. Almost before the syringe could be withdrawn the patient complained of tasting the drug. Within a few moments she had a most violent attack of pulmonary edema, which threatened her life, and she recovered only after a protracted illness. Moreover, this state was followed by prolonged mental disturbance. Needless to say, I have not been inclined to regard this plan of treatment with a great deal of confidence.

Electricity has been used in the treatment of fibroid growths for many years. The methods for applying it were crude, and frequently were attended with great danger, especially when punctures were made through the abdominal wall directly into the tumor by an insulated needle, which thus produced a direct and localized influence upon the structure immediately in contact with the poles. It remained for Apostoli, by his method of measuring the current and fixing the direct dosage, to evolve a plan of treatment which can be practised with a certain degree of precision. Under ordinary means the passage of a current of from five to ten, or at most twenty milliampères is attended with considerable discomfort. By his apparatus and method of procedure from 100 to 200 milliampères are employed. He accomplished this by applying over the external surface a large, comparatively inactive electrode, while he introduced a more active electrode into the vagina, or preferably, into the uterine cavity. He further defined the influence of the positive and negative poles. The positive pole produced a decomposition of the fluids causing about it the accumulation of an acid, while at the negative pole it was alkaline. The former proved the more destructive in its influence, and hence is particularly used in benign diseased conditions of the mucosa which cause hemorrhage. The positive pole within the uterus causes electrolysis or cauterization with coagulation of the blood in the vessels and arrest of bleeding. The negative pole, on the contrary, produces edematous infiltration of the tissues extending some distance about the electrode and the size of the growth decreases by absorption. In practising Apostoli's method are required: an electric battery sufficiently large to give a current strength of 200 to 300 milliampères without its wearing out too rapidly; a galvanometer capable of measuring 500 milliampères; a rheostat, by which the current strength can be increased gradually. A current chooser is important. This is an instrument by which the current can be changed from positive to negative without removing the electrodes. However, the strength of the current must be reduced very greatly before such a change is made as otherwise the patient would receive a violent and painful, if not dangerous, shock.

Electrodes. The external electrode should be placed over the abdomen and may consist of the clay pad of Apostoli, the bladder or water electrode advocated by Martin, or of a towel wet with salt solution over which the electrode is placed. It should be large. The intra-uterine electrode may be a probe insulated within a couple of inches or more of its point. An ordinary probe with a gutta-percha hood which can be slid over it forms a convenient electrode. These are placed in position before the current is applied. The latter is introduced gradually, watching the galvanometer and the expression of the patient in order to ascertain her sensibility. The internal electrode is made of platinum or carbon as these materials have more endurance. Large quantities of strong acids accumulate about the electrode and the electrolytic action would destroy the less durable metals very quickly. The vagina should be cleansed thoroughly before electrical applications to avoid the introduction of infection into the uterine cavity. While electricity is a powerful antiseptic, it is only so in strong doses. Electricity may be given two or three times a week, according to the intensity of the dose. When powerful currents are used, but one application a week is preferable. The séance should last from five to fifteen minutes. Before the application the skin of the abdomen should be inspected carefully for breaks in the corium, by denudation from scratching or from the presence of furuncles. Irritated points should be treated and excluded from contact with the electrode by collodion or pieces of plaster to insulate it. The external electrode, connected with the battery, is placed upon the abdomen. The internal electrode, also connected, is introduced, but with the precaution to have the current closed. The current is opened slowly and carefully, and is then increased gradually to the point of tolerance. Before the withdrawal of the electrode the current is gradually reduced, to prevent severe shock to the patient. In the initial treatment it is important to control the current carefully, and to use currents of moderate intensity, only, until the patient's toleration is determined. It is difficult to fix the number of applications to be required. Usually from twenty to thirty are sufficient.

Electropuncture of the Myoma. Occasionally the situation of the tumor may be such as to displace the external os greatly, to render the canal tortuous, and make the introduction of the electrode difficult. In such cases the myoma may be punctured through the anterior cervical wall. The antisepsis should be as rigid for this procedure as for the most serious operation, and as it is quite painful, an anesthetic should be employed. The vaginal puncture from one-half to one centimeter deep is performed without a speculum. Care must be taken to avoid injuring the uterine artery, the bladder or the intestines.

Electricity exerts its influence in three ways:

1. In the diminution of the tumor from one-fifth to one-half of its original size. Complete disappearance is exceedingly rare.

2. In a most marked influence upon the hemorrhage.

3. In the relief of pain.

The disappearance of pain and the arrest of hemorrhage necessarily improve the general condition of the patient. Apostoli gives the following contra-indications: 1, hysteria; 2, intestinal catarrh; 3, pregnancy; 4, malignant degeneration of the tumor; 5, fibrocystic tumors.

Some of his followers do not consider hysteria an absolute contra-indication, but Apostoli has made the observation that the hysteric possess a great intolerance to the electric current, making it impossible during the course of a sitting to introduce a sufficiently high current to induce favorable results. In intestinal catarrh the current has a strong influence on the solar plexus, which calls forth severe contraction of the intestinal muscle. The presence of malignant growths must necessarily offer a direct contra-indication to electric treatment. The diagnosis sometimes is difficult to determine.

Rapid growth in a myoma subsequent to the menopause indicates some degenerative process, possibly a malignant one, and electric treatment should not be given. In fibrocystic tumors the gas accumulation during the electric treatment may lead to suppuration. Gehrung, in such cases employs a puncture cannula, so that the fluid contents of the tumor can be drawn off. The presence of pus in the adnexa, as mentioned by Apostoli, is a frequent complication and difficult to recognize. Electrical treatment in such cases is harmful without exception. It is not necessary that the inflammation should have reached suppuration in order to contra-indicate the treatment. Very acute or subacute inflammation about the uterus is a positive contra-indication.

Further, a very important contra-indication for electric treatment depends upon the situation of the tumor and its relation to the uterus, and justifies the following statement:

(*a*) In subserous tumors, particularly when they are pedunculated, electric treatment will have but little beneficial effect, and is apt to prove injurious.

(*b*) A pedunculated submucous fibroid affords no special advantages for electric treatment.

In an inconsiderable number of cases suppuration of a polypus has resulted from intra-uterine electric treatment. Often the result has been fatal, or there has been total extirpation of the suppurating organ with or without favorable result. Additional contra-indications are heart failure or acute nephritis. Parsons asserts that hard tumors cannot be influenced by electricity.

Colossal Tumors. In studying the influence of electricity upon the tissues of large growths, polar and interpolar action must be considered.

Polar influence depends incidentally on the electrolytic action in the soft tissues. In the transmission of the current from the metallic body, fluid destruction takes place in a salt solution and an acid is formed about the positive pole of the electrode, while the metal surrounds the negative. Similar changes occur in the tissues of the body, so that about the positive pole acid material, such as carbonic acid and chlorin, is set free. In the cathode watery material—the alkalies—are collected. It is asserted that these materials in the nascent state exert a strong chemic influence. Albumin is coagulated, the vessels are narrowed, and a hard, dry, brown-red slough occurs, while under longer employment the tissues are destroyed. About the negative pole a soft, succulent, glue-like, easily scraped-off white slough occurs, as if one had employed concentrated caustic potash. Consecutive hemorrhages may follow its continued use. The negative current is absorbent, and is much more painful than the positive. Investigations have demonstrated that the positive pole acts more on the cell germs or cellular tissue, and the negative upon the protoplasm. The latter is more diffuse, while the former has a sharper limitation.

The Interpolar Method. Apostoli's critics assert that his methods are not without danger. The principal dangers for myoma operations are hemorrhages and sepsis, but radical operations present various series of dangers—embolus, pneumonia, ileus, and death from chloroform as well as the later disturbances of nutrition. When the advantages and disadvantages of electric treatment are considered, the investigator is forced to the conclusion that it should be confined to the uncomplicated cases, while those cases which threaten life should be subjected to operative treatment.

The surgical treatment of fibroid growths may be either palliative or radical, but we will consider the procedures under the two divisions of vaginal and abdominal, according to the route by which the tumor is most accessible and may most readily be subjected to treatment.

VAGINAL PROCEDURES.

The vaginal procedures consist in:

1. Dilatation and curetment.
2. Incision of the cervix.
3. Incision of the capsule.
4. Removal.
   a. Torsion.
   b. Incision of the pedicle.
   c. Enucleation.
   d. Morcellement.
5. Ligation of the vessels.
6. Hysterectomy.

The abdominal route includes:

7. Castration.
8. Ligation of vessels.
9. Myomectomy.
10. Enucleation.
11. Supravaginal amputation or partial hysterectomy.
12. Panhysterectomy.

311. Vaginal Procedures. 1. *Dilatation of the uterus* may be indicated as the first stage in treatment of myomata or for diagnosis. Dilatation may be effected by the mechanical dilators of Hegar, but without tearing the neck they afford insufficient enlargement of the cervical canal to permit the introduction of the finger. The preferable method of dilatation is the employment of a laminaria tent, and the vagina should be cleansed thoroughly and rendered as nearly aseptic as possible before its introduction. The os is exposed by a Sims speculum or perineal retractor. The cervix is seized with a double tenaculum, the os exposed, the plug of mucus filling the cervical cavity removed, and the canal thoroughly cleansed by mopping it out with cotton saturated with hydrogen dioxide after which as large a tent as can be introduced is selected, or, when the canal is pretty well dilated, a nest of tents may be used. Time can be saved by the introduction of several bougies preliminary to the insertion of tents. The larger number of tents which can thus be inserted permits the cervix to be so dilated by the first set that the uterine cavity can be explored by the finger upon their removal. These tents previous to their insertion should be sterilized by heating, placed for a few minutes before use in a saturated solution of iodoform and ether in a mixture of equal parts of carbolic acid and alcohol, or, better still, in tincture of iodin. After the introduction of the tent iodoform gauze is placed beneath it to protect the parts from infection and to keep the tent from being extruded. Usually, at the end of twelve hours the cavity will be sufficiently dilated to permit the introduction of the finger. If the dilatation is insufficient, the canal can be enlarged by Hegar's bougies or with a second series of tents. The exposure by dilatation permits the situation of growth and its size and relations to be recognized. The curet is used in a manner similar to that described in the treatment for endometritis. It should be done thoroughly to remove the hypertrophied mucous membrane. This removal of hypertrophied tissue ruptures and scrapes away the diseased vessels, and is effective in the arrest of hemorrhage. It should be followed by careful irrigation of the cavity, and subsequently by painting the canal with tincture of iodin or carbolic acid, or with a mixture of these two agents. When there is much hemorrhage following the use of the curet, the uterus should be packed with iodoform gauze.

Curetment of the uterus, while effective in decreasing the hemorrhage, is not unattended with danger. The injury to the surface of the tumor may cause an inflammation, which will interfere with its nutrition, and, by the presence of germs which have been introduced during the procedure, may eventuate in suppuration and extensive necrosis. When myomata project into the uterine canal and the latter is irregular, difficulty is experienced in reaching all points of the canal with the curet, and the plan of treatment will not be effectual. In small tumors that cause severe hemorrhage curetment is of no value, and nothing short of the removal of the tumor will be of service. Indeed, I question the wisdom of the employment of the curet in any submucous or interstitial tumor for hemorrhage, as it is possible for the nutrition of the growth to become so impaired through the process of necrobiosis that such a formation of toxins is engendered as to affect the general health of the individual adversely. It is much better that the employment of tents should be a preliminary to measures for the extirpation of the growth.

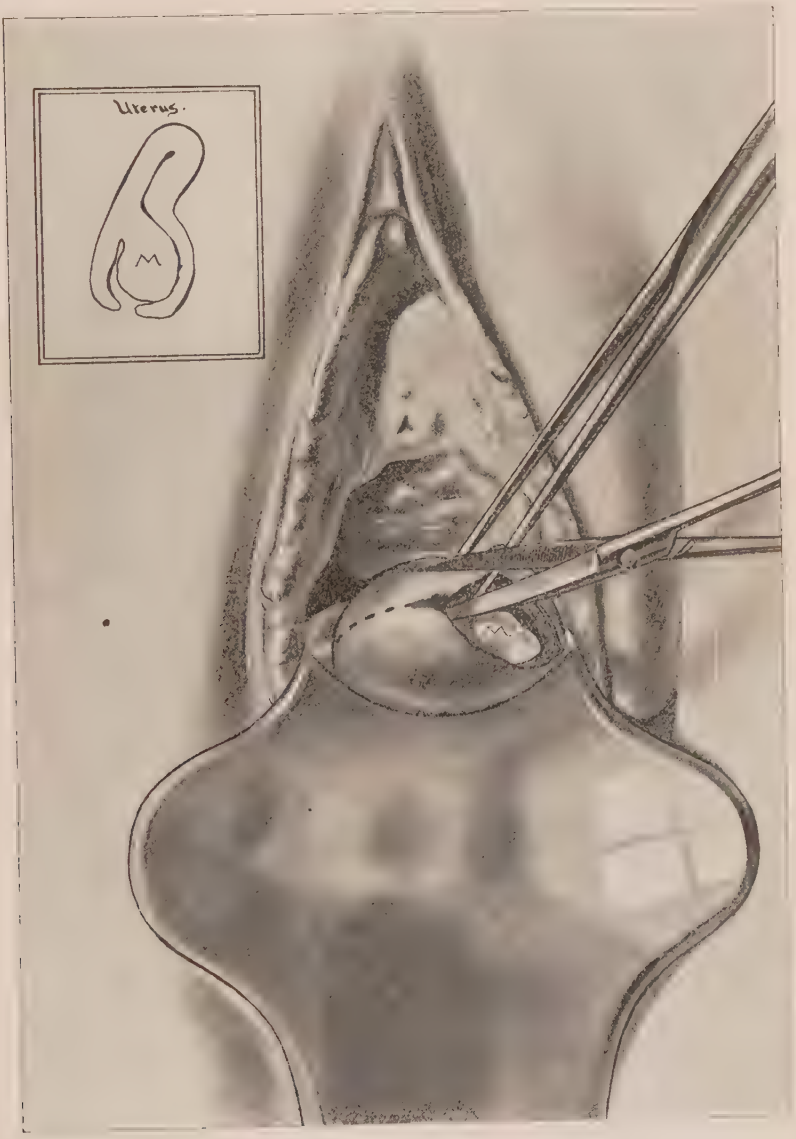


Fig. 508.—Incision of Cervix to Expose Intra-uterine Myoma.

2. *Incision of the cervix* is another palliative measure. (Fig. 508.) It consists in making a bilateral or an anteroposterior incision through the cervix, which diminishes its resistance and facilitates the extrusion of

the tumor. When the body of the uterus is well dilated by the growth, this procedure permits the tumor to be extruded more rapidly into the vagina, and it is thus rendered more accessible. It was formerly practised very generally as a preliminary to the administration of ergot, but not infrequently the rapid separation of the tumor thus induced led to gangrene or necrosis of the growth and to fatal infection of the patient. Incision of the cervix will frequently prove of value as a first step in operative procedure for the removal of a growth, and its employment should be limited to such instances.

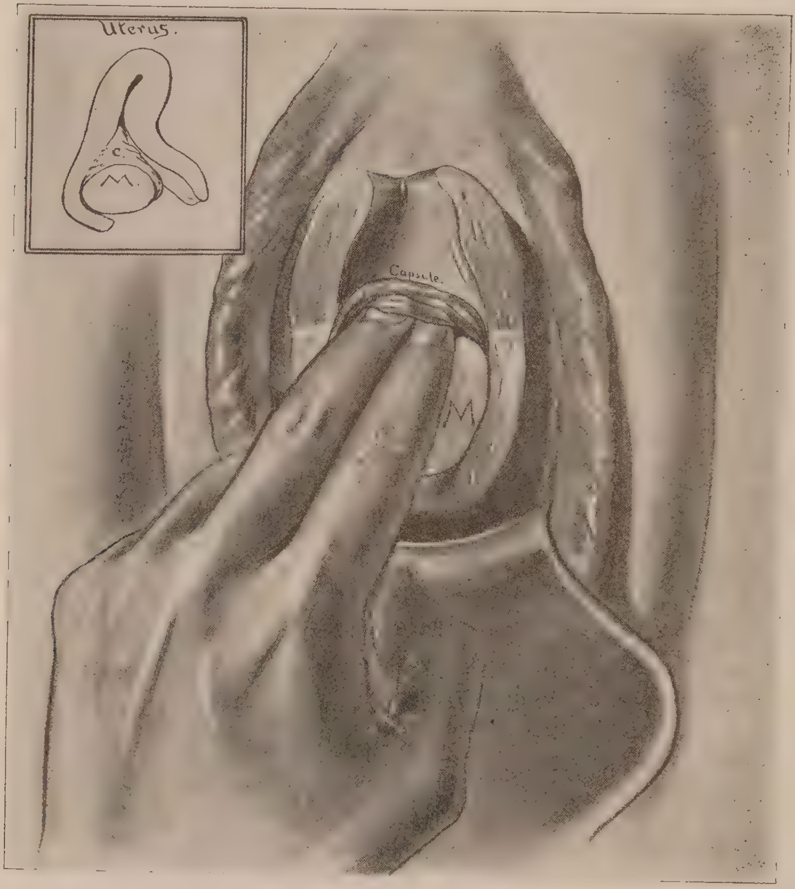


FIG. 509.—Cervix and Capsule Incised, the Latter Pushed Back.

3. *Incision of the Capsule* (Fig. 509). In sessile submucous or interstitial fibroids which project into the cavity of the uterus the more rapid expulsion of the tumor can be accomplished by incising the uterine surface of the tumor into and through its capsule. The incision is accomplished by wrapping the blade of the knife with adhesive plaster at a necessary distance from the point, as advocated by Atlee, or the thermocautery or

galvanocautery knife can be employed. The wall is pushed back and the tumor partly enucleated, which decreases the resistance. Subsequent contraction promotes the extrusion of the tumor into the uterine cavity and renders it a pedunculated growth. This operation, though apparently but a slight one, is not free from danger, for the rapid extrusion which follows its performance not infrequently causes loss of vitality of the tumor and degenerative processes which may be dangerous to the life of the patient. The procedure is advisable only when it is used as one of the preliminary stages for removal of the growth.

4. *Removal of the Growth.—a, Torsion* (Fig. 510). When the growth is situated in the vagina, after having been extruded from the cavity of the uterus, and hangs by a pedicle, it can be removed readily by torsion. The technic of the procedure consists in placing the patient in the dorsal position and exposing the tumor (after thorough asepsis) with an Edebohls speculum or with retractors. The growth is seized with a strong vulsellum forceps, preferably four-bladed, and turned upon its axis until the pedicle of the tumor is twisted off. When such forceps are not at hand, the same purpose can be accomplished by seizing the tumor upon opposite sides with double tenacula and rotating it by traction with these instruments. When the tumor has not been extruded from the cervix, the os can be enlarged by a bilateral incision until the intra-uterine tumor is exposed, when it can be removed, if the tumor is pedunculated, in the manner described.

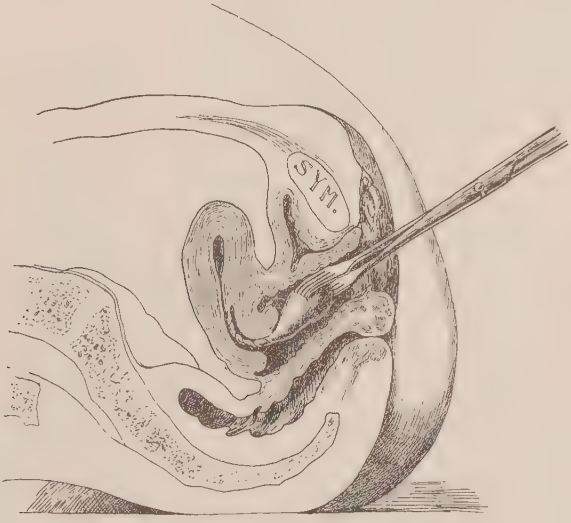


FIG. 510.—Removal of Myoma by Torsion of Its Pedicle.

b, Incision of the Pedicle. When the tumor has been extruded from the uterine cavity, it may be seized and dragged upon with a pair of forceps until the finger can be passed over it as a guide, when with a pair of scissors (Fig. 511) the pedicle can be cut; or the intra-uterine tumor can be

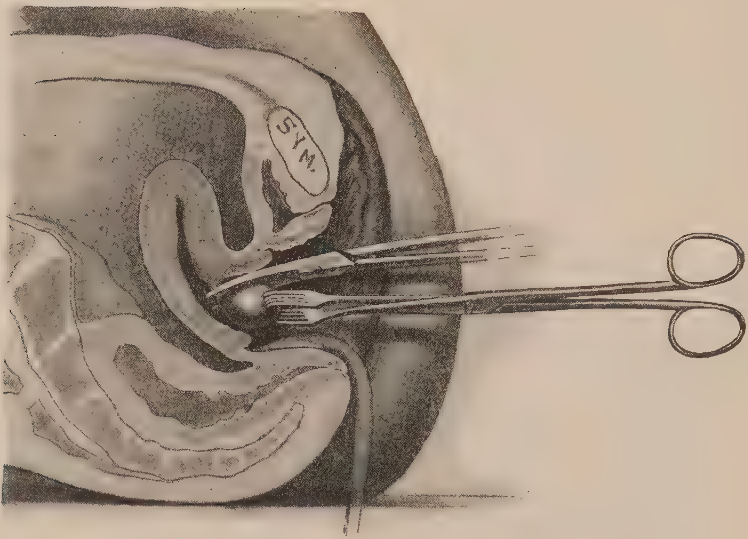


FIG. 511.—Incision of Pedicle of Myoma.

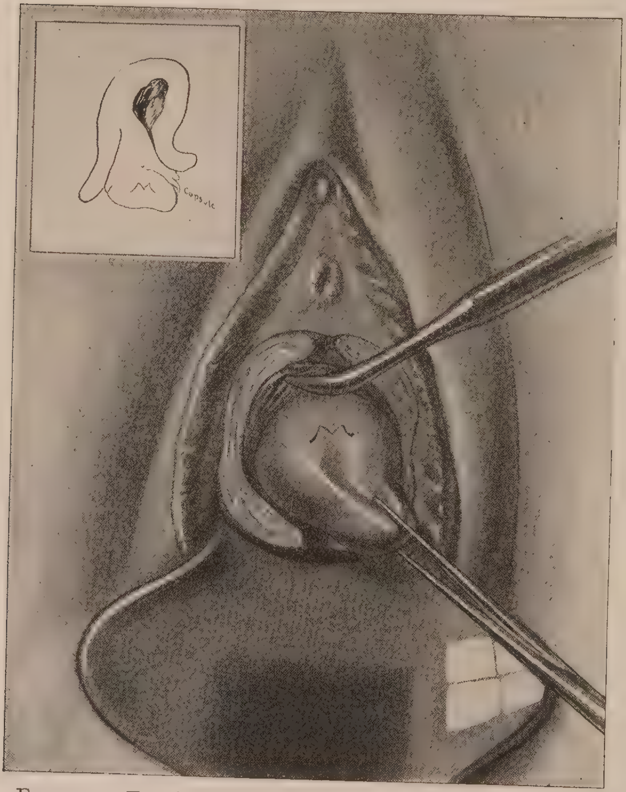


FIG. 512.—Enucleation of Tumor through the Vagina.

rendered accessible by dilatation with tents, or through bilateral incision of the cervix. The employment of the wire écraseur or the galvano-cautery wire is advocated by some for cutting the pedicle, but any hemorrhage likely to occur can be controlled by gauze packing, and the procedure lessened beyond the danger of hemorrhage, affords no advantage to compensate for the extra loss of time. In all these operations rigid asepsis must be practised.

c, *Enucleation* was first practised upon submucous fibroid growths of the sessile variety. Here, when or after the uterus is dilated, the tumor is exposed, seized with a pair of forceps, drawn upon, and, with the finger or a blunt dissector, the attachment to the uterus is broken and the tumor removed. Thomas employed a serrated spoon which hugged closely to the surface of the tumor and pushed away the uterine wall. (Fig. 512.) This spoon, however, is not without danger in cases in which the uterine wall overlying the tumor is thin. The enucleation can be accomplished as readily with a blunt dissector. The tumor should be rolled about during the procedure so that the surface to be separated is constantly under observation. When the tumor for enuclea-

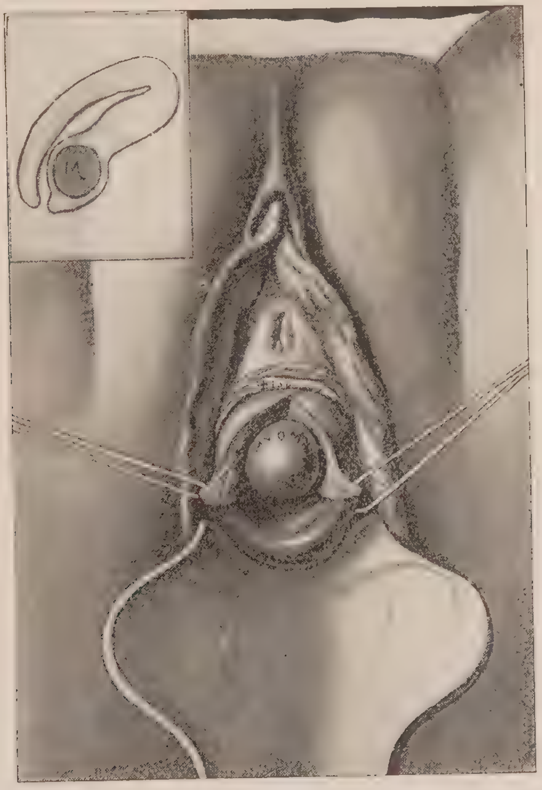


FIG. 513.—Interstitial Tumor Exposed by Vertical Incision of the Anterior Lip.

tion is within the body of the uterus, the finger should be used as a guide. Interstitial tumors may also be removed in a similar way. If necessary, the cervix may be split by a bilateral incision through the internal os as a preliminary. An interstitial tumor of the anterior wall may be made accessible by a vertical incision through the anterior lip until the base of

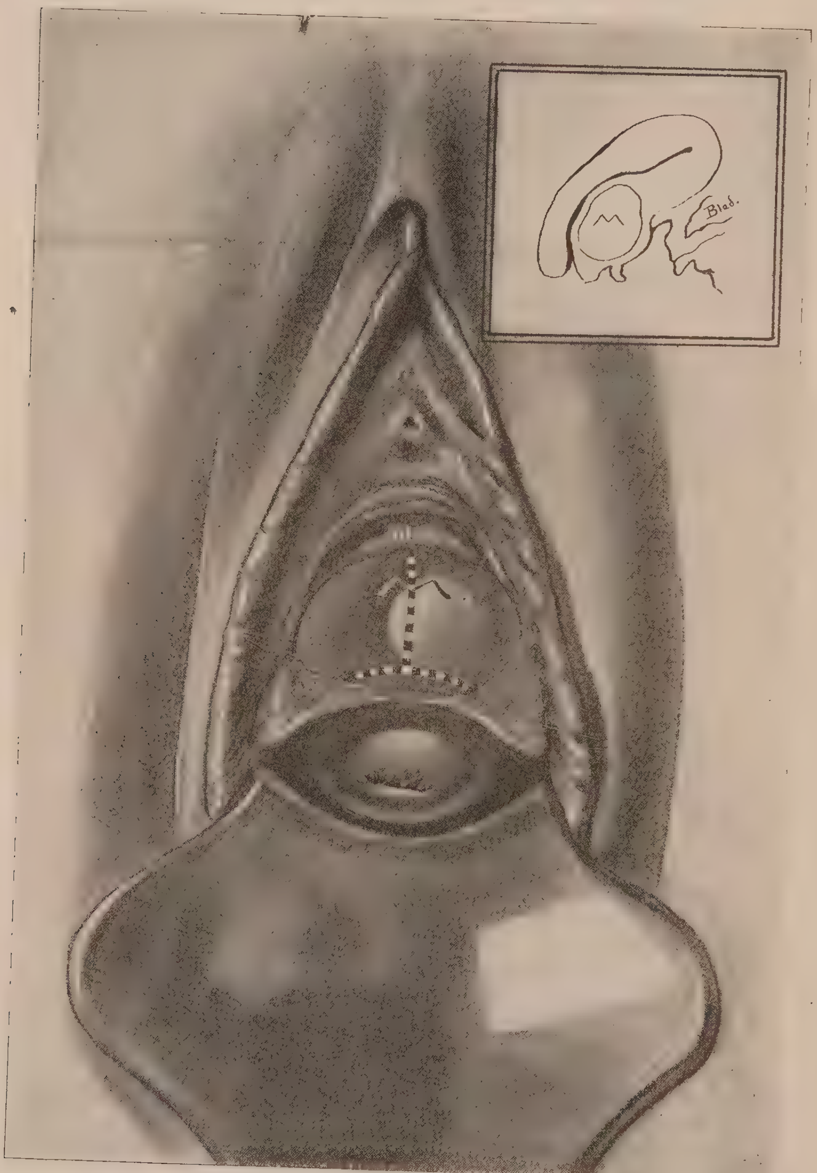


FIG. 514.—Myoma of Anterior Wall Exposed by Transverse and Vertical Incision.

the tumor is exposed, when it is seized and the tissue bluntly dissected away from it. (Fig. 513.) Occasionally, when the cervix is undilated and the tumor is in the anterior wall, it may be exposed by a transverse incision above the cervix, and subsequently by a vertical cut at right angles to the former (Fig. 512). The flaps are turned back, after which the tumor is enucleated. When necessary, the bladder should be dissected from the anterior surface of the uterus until the peritoneum is reached, and the latter can be opened. Retro-uterine tumors are made accessible through a posterior vaginal incision, which will permit the fundus to be rotated backward. Through this opening the enucleation is accomplished and the line of incision carefully closed by sutures before the organ is returned to its normal position. (Fig. 515.)

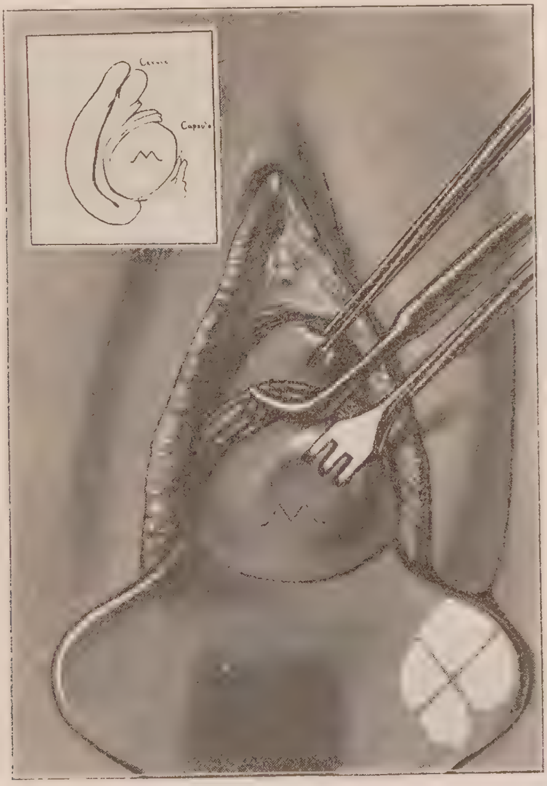


FIG. 515.—Myoma of Posterior Wall Exposed by Retro-uterine Incision.

d, Morcellement. Not infrequently, as we proceed in the enucleation of these growths, it will be found that a tumor is so large that we are unable to complete our enucleation or to deliver the tumor through the vagina. In such cases the tumor may be reduced in size by the process described by the French as morcellement, which consists in cutting out sections of the mass with scissors or knife, and working up on one side until the tumor can be drawn down and the remaining portion completely enucleated. It frequently can be accomplished by dividing the tumor into halves, quartering it, or cutting off small sections of the accessible portions with scissors or knife until the entire mass is removed.

The principle of morcellement is applied to the removal of the uterus as well as to extirpation of morbid growths. The object is to insure the reduction of the size of the organ until it can pass through the vagina readily. It consists in splitting the cervix by vertical incision, then removing wedge-shaped masses from each side. Avoid nearer approach than one-half inch to the lateral surfaces of the uterus. During the procedure the parts are made tense by traction upon the mass with a double tenaculum. (Fig. 516.) Care must be exercised to secure a new grip upon the remaining portion before any piece is excised. Upon the completion of the delivery of the uterus, hemostasis is accomplished as in hysterectomy, which will be described later. After removal of the growth by enucleation there will remain a considerable cavity, lined by tissue of low vitality, which should be cleansed thoroughly, packed loosely with iodoform gauze, and the patient watched that no renewal of bleeding occurs. The gauze packing prevents accumulation of blood in the

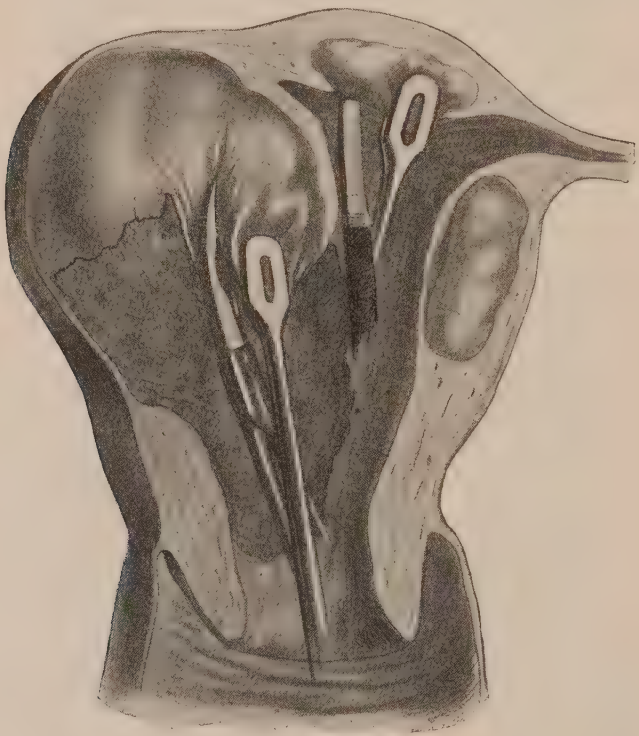


FIG. 516.—Removal of Myoma by Morcellement.

uterine cavity, keeps the surfaces separated, promotes the sealing of the surfaces by plastic exudate, and, by its presence as a foreign body, favors contraction of the remaining portion of the uterus. In three days the gauze should be removed, the cavity irrigated thoroughly, and the uterus repacked, or a drainage-tube inserted, through which irrigation can be practised subsequently. When the cervix has been incised, the wound should be sutured as in an operation for lacerated cervix. All incisions, whether bilateral, through the anterior lip, or in the wall of the uterus, should be closed by suture.

5. *Ligation of the Vessels.* The usual observation that myomata decrease in size with the cessation of the periodic congestion of the uterus at the establishment of the menopause induced Gottschalk and Martin to endeavor to decrease the blood-supply to such growths and thus avoid the necessity for sacrificing the function of procreation. Gottschalk was the pioneer in vaginal operations for this special purpose. He limits the operation to extraperitoneal tumors, and in seven years found but twenty cases in which it was applicable. Of sixteen of these, which continued under observation, decrease in pain and hemorrhage was experienced by the majority. In a few the good results were delayed.

The treatment is as follows: The patient is placed in the lithotomy position, the uterus explored, and any submucous myomata removed, followed by cureting as a routine measure. A circular incision in front of the cervix is prolonged as far as its posterior surface. The bladder is bluntly dissected from the uterus and broad ligaments and the vaginal mucosa loosened upon each side posterior to the broad ligament. The uterine artery and its branches are palpated and secured by three chromic catgut ligatures upon each side, which are cut short and buried by vaginal suture of the mucosa. The operation is followed by severe pains, and a few days later by a cast of the endometrium. In but three instances did the first menstruation occur at the normal period. Franklin Martin pursued the following course: With the patient in the lithotomy position he dilated, cureted, irrigated the uterus with 1:1000 bichlorid solution, and packed it loosely with iodoform gauze. He pulled the cervix to one side, made a lateral curvilinear incision over each uterine artery, and pulled the bladder away from the anterior surface of the broad ligaments for over two inches, while the latter were partially isolated upon their posterior surfaces. The vessels were recognized and guarded by the finger, a ligature was passed upon each side, and the ends were cut short. Care had to be exercised that a ureter was not included in the ligature. He advised that in large tumors the broad ligament should be spread out still further and the ovarian artery upon one side seized and ligated. The ligated tissue was buried by suturing the vaginal mucosa, and the vagina was packed loosely with iodoform gauze. Both the vaginal and uterine packing were removed at the end of two days and bichlorid douches given subsequently. This confines the future blood supply of the tumor to one ovarian artery. Martin found that this plan of treatment resulted in arrest of hemorrhage and decrease in the size of the growth. The main objection to this plan of treatment is the possibility that in the ligation too much of the supply of blood may be cut off, and cause a loss of vitality and subsequent necrosis of the growth, which will greatly increase the danger to the patient.

6. *Hysterectomy.* Removal of the uterus with the offending growths can be done with advantage through the vagina when the latter is large and roomy and the uterus is not too large and is freely movable. The operation should not be considered when the growth extends higher than midway to the umbilicus, when the broad ligaments are occupied by growths, or when the growths affect the nulliparous woman. There are two principal methods of operating: 1, The removal of the uterus without section, and 2, division of the organ in order to reduce its bulk. The first procedure bears the name of Péan. The technic as modified by present methods is as follows: The patient is placed in the lithotomy position; the vagina is scrubbed with tincture of green soap, with sterile water and with alcohol; the cervix exposed with retractors; and the plug of mucous wiped from the external os. The cervix is seized with strong forceps, or, where it is desirable to prevent discharge from the cavity, the cervix may be closed with sutures which will serve as tractors if left long. It is separated from the vagina by an oval or circular incision carried nearer the os in front than behind. This incision may be made with knife, scissors, or thermocautery. The finger or a blunt instrument dissects the bladder from the uterus and broad ligaments, and at the same time the ureters are pushed back. After posterior dissection has been accomplished in the same way and the peritoneum opened in front and behind, the uterus remains attached only by the broad ligaments. The uterine artery is exposed, ligated on either side with chromic catgut and cut between the ligature and the cervix. The ends of the ligature are cut short to prevent the danger of subsequent traction pulling the ligature from the vessel. The fundus is turned down through the anterior vaginal fornix and as traction is made on it, the broad ligaments are rendered tense, permitting the relations of the tubes and ovaries to be determined more readily and existing adhesions separated. The broad ligament, preferably on the left side, is securely ligated, clamped above the ligature with hemostatic forceps and the broad ligament cut between the ligature and the appendages. Readier access is thus afforded to the right broad ligament which is treated in a similar manner. The cut surfaces are carefully inspected for bleeding vessels which are at once secured, and the peritoneum front and back united to the vaginal walls. From either side a suture is carried through the anterior vaginal wall and peritoneum, the stump of the broad ligament above the hemostat, through the posterior wall from the peritoneum out and securely tied above the hemostat which is then removed. While the external angle of the incision in the vagina is held the stump of the broad ligament is pushed behind it and the vagina sutured. Thus both the peritoneum and the vagina are closed so that no raw surfaces present in either. Ligatures for vessels and securing the stumps in the angles of the wound should be chromic catgut; those uniting the peritoneum to the vagina and closing the latter, of plain catgut.

It may be necessary to vary this procedure to meet special indications, as the growths may be so large as to require their enucleation preliminary to turning down the fundus; or it may be necessary to bisect the uterus and remove each half of the organ separately. If still too large for delivery portions of the organ and the growths may be removed until its size is sufficiently reduced to permit of its withdrawal. When the tubes and ovaries are the seat of suppurative conditions which make it inexpedient to close the wound, the cavity should be packed with iodoform gauze and treated as an open wound. Clamps may be employed in the place of ligatures. This is a more expeditious procedure, but in addition to the foul wound from the sloughing tissue included in the clamps, hemostasis is not as secure. Schauta lost seven out of forty cases with the use of clamps, chiefly from secondary hemorrhage after their removal. Convalescence is greatly delayed by necrosis of the clamped portion of the ligament. Bishop reported eight hundred and thirty-six cases of vaginal hysterectomy with twenty-nine deaths, a mortality of 3.4 per cent. Some operators pride themselves on being able to remove per vaginam growths which extend to the umbilicus, but such a course is attended with so much increase of danger as to render it an unjustifiable procedure.

312. Abdominal Route. 7. *Castration.* As early as in 1872 Hegar advocated the removal of the ovaries to establish premature menopause in order to accomplish reduction in the size of fibroid growths. This procedure was devised in recognition of the fact that fibroid tumors generally decrease in size with the establishment of the climacteric. The operation consists in the removal of the ovaries and tubes or the performance of oöphorectomy. It was found, however, that the removal of these organs was not infrequently attended with great difficulty, as the size of the growth led to a vascular condition of the broad ligaments, and often the ovary was spread out upon the surface of the tumor, which rendered its enucleation and removal exceedingly dangerous; sometimes the tumor rotated in such a way as to carry one ovary posterior, rendering it absolutely inaccessible without reduction of the size of the tumor. Moreover, the ovary might be wedged between two multinodular growths, whence it could not be removed without injury to both. Moreover, the procedure was not always successful, as many patients who were victims of fibroid growth continued to menstruate or to have a bloody discharge subsequent to the removal of both ovaries. This is due probably to the fact that the ovarian stroma extends along the course of the ovarian ligament, and the ordinary method of procedure did not remove the entire ovarian structure. So long as any portion of the ovary remained to mature and throw off ova, just so long would bleeding from the uterus occur. Tait advised the entire removal of the Fallopian tubes as a sure method of establishing the climacteric, attributing the influence dominating menstruation to these organs. The advantage of this suggestion doubtless was that the ligature was carried deeper and the ovarian arteries ligated, as they had escaped this in the more superficial ligation. To insure ligation of the artery it is recommended that the ligature be placed sufficiently deep to include the round ligament. The advantage of castration is that in typical cases it can be done in a few minutes with slight danger; but, unfortunately, in large fibroid growths the ovaries are not always typically situated. In considering this operation then, the situation of the ovaries and their relation to the growth should be examined to ascertain whether both ovaries can be removed completely. The removal of one would exercise no beneficial influence on the progress of the growth nor would it correct abnormal symptoms. Occasionally, the tumor causes torsion of the uterus, by which one ovary is moved toward the front and the other behind the tumor in such a situation that it cannot be reached; or, as noted, the ovary can be so intimately connected with the surface of the tumor that any attempt to enucleate or remove it would be attended with more serious hemorrhage than would be occasioned by the removal of the growth. Another objection to castration is that it does not always control the hemorrhage. In the performance of the operation it is absolutely necessary that every portion of both ovaries should be removed. The smallest amount of ovarian tissue remaining insures the continuation of the hemorrhage. When the fibroid is large, entire removal is frequently attended with the greatest difficulty, as the adherent ovarian stroma cannot be separated readily from the surface of the tumor. The operation is still further complicated by the existence of tubal diseases, such as pyosalpinx, in which extensive adhesions bind together the ovaries, tubes, and tumor in one mass, so that castration will be attended with greater obstacles and danger than would be associated with hysterectomy. Castration should not be considered in cases of pure submucous myoma or in cystic degeneration of the fibroma. In pedunculated subserous and adherent tumors, and in very large interstitial growths, it is also contra-indicated. In a freely movable uterus, in which the cervix can be reached readily, the operation affords no advantages over supravaginal amputation. Frequently castration has a further disadvantage in producing vasomotor symptoms, such as congestion, sweatings, hot flashes, or pain in the head and sacrum. These symptoms are worse in the young than in those who are near the climacteric. Other symptoms are rather more rare, as obstinate vertigo, profuse leukorrhea, cardialgia, and occasionally vicarious bleeding.

8. *Ligation of the Vessels.* The operation of castration having demonstrated the beneficial influence of ligation of the ovarian arteries, it was a natural step to proceed to ligation of these vessels through the abdominal incision in preference to the more radical operations of partial or complete hysterectomy. Hofmeier reported a case of Schröder's in which extirpation of the myoma seemed impossible, and in order to decrease the size of the tumor, the lateral and median vessels of the ovary were tied, with good result. Antal, at an earlier date, after ligation of the vessels observed an atrophy of the ovary, and, in place of castration, thereafter employed incidentally the mere ligation of the vessels in order to affect the function of the ovaries. Byron Robinson advocated the ligation of both ovarian arteries and the upper part of the uterine artery at the side of the uterus. This procedure is more effective in the smaller growths, or where hemorrhage is a marked symptom.

9. *Myomectomy.* In more or less pedunculated subperitoneal fibroids there should be no question as to the advisability of myomectomy. When the pedicle is small, the operation consists in cutting through it with scissors or knife and uniting the edges of the cut surface with sutures

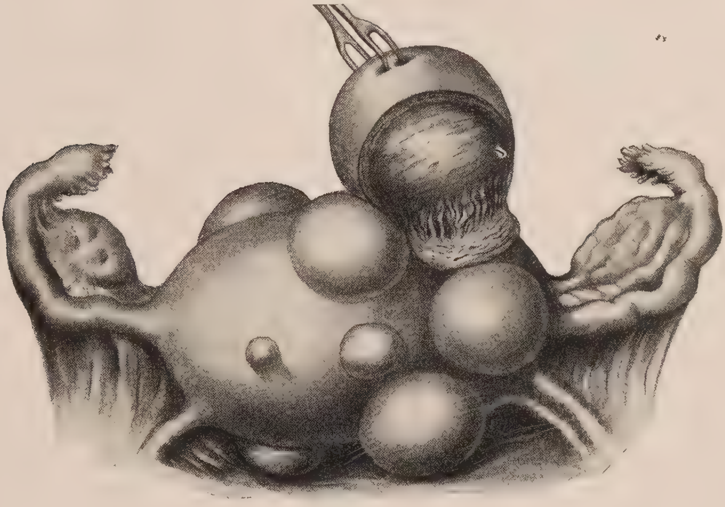


FIG. 517.—Abdominal Myomectomy.

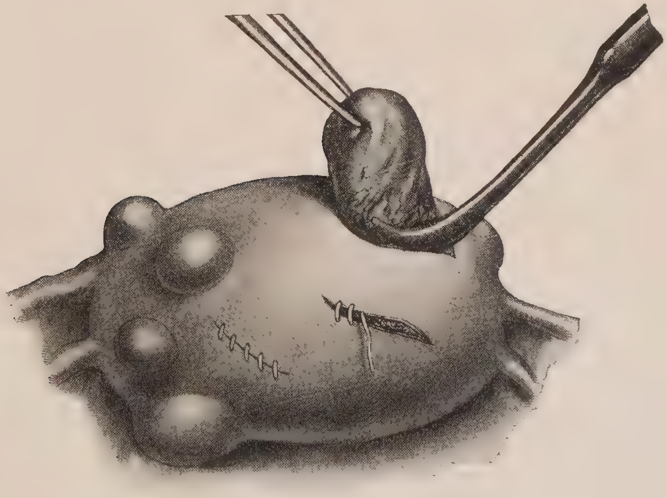


FIG. 518.—Abdominal Enucleation of Myomata and Method of Closing the Uterine Wound.

so deeply placed as to make sufficient pressure to control bleeding. (Fig. 517.) When the pedicle is not large, its peritoneal covering should be cut through by the circular incision, turned down like a cuff, the base of the pedicle ligated with chromic catgut and the tumor cut away, after which the peritoneal cuff can be united over the stump. In larger pedicles the operation consists in making peritoneal and muscle flaps, which can be sutured. Thus a single growth or a number of growths may be removed, leaving a normal uterus and the ovaries and tubes undisturbed.

10. *Enucleation.* The ease with which smaller fibroid growths can be enucleated from their beds has led to the practice, by Martin and others, of shelling out interstitial fibroid growths from the uterine wall, leaving the uterus in place. (Fig. 518.) The procedure is as follows: The uterus is raised up, the position of the growths determined, and an incision made over the more prominent growths in a vertical direction in order to injure as few vessels as possible. Incision is made into the uterine wall through the capsule, and the tumor exposed. It is then seized with a double tenaculum and drawn up, while the tissues are pushed off with a blunt dissector and the enucleation accomplished. The removal of the tumor is followed by packing a gauze pad firmly into its cavity. If large vessels bleed, they should be seized and controlled with pressure forceps. The wall is still further investigated, and, when possible, other fibroid growths situated within it should be brought through the first incision. In some cases, however, this may involve more extensive mutilation of the uterus than a separate incision over the mass.

Advocates of this procedure generally limit it to cases in which few growths are found in the uterine wall, and formerly it was directed particularly that the uterine cavity should not be opened. When, however, we consider the investigations of Menge and Krönig, which demonstrate that the uterine cavity is free from pathogenic germs, there should be no hesitancy in opening it, if necessary, to remove growths. In one patient I thus enucleated thirteen fibroids from the wall of the uterus, five of which were removed from the uterine cavity. After the operation the patient recovered without a single abnormal symptom. From another woman nine growths were removed. In another woman (unmarried) twenty growths were enucleated. What remained of the uterus was pretty well riddled, but it was sutured together and the patient recovered completely. In an unmarried woman nine growths were removed, five of them from the anterior wall. The loose tissue, being of low vitality, subsequently became necrotic, and in the sixth week after the operation this was withdrawn through a sinus in the abdominal wound; subsequent convalescence was rapid. In an unmarried woman, a fibroid, projected into the cavity of the uterus, filled it up so that the tumor could be touched through the cervix. This was enucleated through the abdominal cavity by posterior uterine incision. A gauze drain was passed through the cervix and the uterus closed over it. The patient recovered. After enucleation of growths, the gauze inserted temporarily should be removed, and uterine wounds sutured carefully by deep and superficial layers of chromic catgut, exercising the precaution to include and secure with the suture any large vessels in the wall which may bleed, and by the superficial suture to bring a good portion of the peritoneal surface in apposition. Before closing the abdomen all the wounds must be inspected thoroughly to see that hemorrhage is controlled completely. Should there be a tendency to excessive bleeding, it would be better as an additional safeguard to ligate the ovarian arteries. This operation is unsuitable for very large growths where the uterus would be extensively mutilated, or where the tumors are situated laterally and involve to a greater or less degree the Fallopian tube. In enucleation of intraligamentary growths the broad ligament is split, in order to expose them. In these cases care must be exercised that the ureter has not been displaced upward. It is important, also, to avoid injury to the ureter or its ligation in the subsequent closing of the broad ligament.

11. *Partial hysterectomy, or supravaginal amputation of the uterus,* was the earliest abdominal operation for the removal of myomatous growths. The earlier operations were performed in cases of mistaken diagnosis, having been undertaken for the removal of ovarian tumors. The first deliberate operation seems to have been performed by Burnham, of Lowell, in 1853. The patient recovered. A large proportion of the earlier operations were unsuccessful; the difficulty in controlling hemorrhage from the elastic stump rendered its intraperitoneal treatment exceedingly dangerous, so that the plan was practised of treating the stump extraperitoneally. The first surgeon to devise a systematic procedure was Koberle, of Strasburg. His method was as follows: The patient was placed in the dorsal position, and a long abdominal incision made in the median line, through which the uterus and tumors were delivered. The peritoneum above the bladder was incised and the latter stripped down, an elastic ligature or serre-nœud was placed about the cervix as low as possible, and pins were passed through it above the serre-nœud. The uterus and tumors were cut away above the pins, leaving enough to prevent traction of the stump from the grip of the instrument; the abdominal wound was closed down to the stump, while the latter was subjected to cauterization; and an application of persulphate of iron or tannin made to its raw surface to secure mummification. By some operators the parietal peritoneum was fastened to the peritoneal covering of the stump by a continuous catgut suture. This procedure was done to promote the rapid union of the peritoneal surfaces and thus preclude the possibility of discharges from the sloughing stump gravitating back into the peritoneal cavity.

Occasionally, under this plan of treatment, the stump would become dry and gradually be thrown off without suppuration. However, the retraction of the stump resulted in an excavation which had to close by granulation, prolonging convalescence. Often it was difficult to prevent putrefactive changes resulting in suppuration. The weakened abdomen favored the subsequent development of ventral hernia. The difficulty in maintaining asepsis, the delayed convalescence, and the weakened abdominal wall, led to the study of methods by which the stump could be treated within the peritoneal cavity. One of the earliest operators to attempt the intraperitoneal treatment was Schröder, who published in 1880 an account of his cases. He made a median incision, ligated that portion of the broad ligament containing the spermatic arteries with two ligatures, and cut between them. A similar course was pursued with the round ligaments. The peritoneum was cut across and the bladder pushed down. The stump, consisting of the cervix, was constricted by a rubber ligature, the mass cut away above the ligature, the stump caught with vulsellum forceps before the division was completed, and the cervical cavity cauterized with a 10 per cent. solution of carbobic acid. The divided surfaces were united near the mucous membrane with sutures; the raw surface quilted in with several rows of suture, and, finally, the peritoneum was sutured over the stump, after which the rubber ligature was removed. He employed carbolized silk, and later juniper catgut, for sutures. Other operators have modified this procedure, as Zweifel, with partition ligature, and H. O. Marcy, with cobbler suture. Gow makes the following modifications: After delivery of the tumor through a median abdominal incision he ligates each round ligament on a level with the internal os, marks out an anterior peritoneal flap, and divides the round ligament and the anterior portion of the broad ligament between the uterus and the ligatures with scissors, carrying the incision toward the middle of the Fallopian tubes. The anterior flap is stripped down, the ovarian vessels and the Fallopian tubes enucleated and tied, so that at least one ovary is left. The broad ligaments are divided on the uterine side of the ligature, and bleeding from vessels connected with this portion may be controlled temporarily by clamps. He then marks out a posterior flap and dissects it downward for a short distance, seizes the uterine arteries with pressure forceps at the level of the os internum, cuts the tumor away with a knife, seizes and draws up the stump with vulsellum forceps, ties the uterine arteries, inserts a precautionary ligature by thrusting needles armed with silk through the stump from before backward, avoiding the peritoneum, so as to include the outer portion of the stump. This, done upon both sides, controls oozing or spurting from vessels which may have been given off obliquely. The bleeding area also may be encircled with a ligature passed by a needle. Two anteroposterior sutures are introduced through the muscular surface of the stump, avoiding the peritoneum; the raw surfaces, as a rule, are sewed together, the peritoneal flaps united, the peritoneum cleansed, and the abdomen closed. Baer modifies this operation. He places the patient in the Trendelenburg posture, and after separating the adhesions the tumor and uterus are delivered through an abdominal incision, gauze is placed front and back, and each broad ligament is transfixed by a single silk ligature, which, when tied, controls the ovarian arteries and veins. The ligated parts are then severed external to the tube and ovary, incision being carried close to the cervix. The peritoneal reflection anterior to the uterus is cut through with scissors, the bladder stripped down with the handle of the scalpel, the uterine artery tied close to the cervix on each side and the cervix amputated just above the vaginal attachment. A small posterior fold is formed by stripping up the peritoneum while the amputation is made. The stump is now held in the grasp of tenaculum forceps. When the main arterial branches have been ligated properly, the raw end of the cervix will remain dry. (Fig. 519.) When all bleeding has been controlled, the peritoneal folds are adjusted loosely over the stump with Lembert sutures and the abdominal incision is closed. (Fig. 521.) The occasional accumulation of blood or serum beneath the peritoneum over the stump and its infection, by the formation of a cellulitis or pus-collection, may delay convalescence. Le Bec, after abdominal section, draws out the uterus and fibroids, ligates the broad ligament with a double ligature, and severs it between the ligatures. The round ligaments are ligated separately and the bladder with the peritoneal flap dissected down into the vagina. The tumor may be decreased in size by throwing a rubber ligature around the cervix and cutting away the mass above, or the tumor can be drawn over the pubes, a long curved forceps inserted into the vagina so that, when opened two or three centimeters, the posterior fornix is stretched. A small incision is made into the pouch of Douglas, and widened by opening the forceps. The tumor is drawn back and forceps are introduced so as to protrude against the anterior fornix, when the latter is treated in the same way. Care must be exercised, however, not to rotate the tumor to one side and thus injure the large uterine veins. One end of a long silk thread is seized by forceps, carried into the vagina, and brought up again through the opening in Douglas' pouch. Another

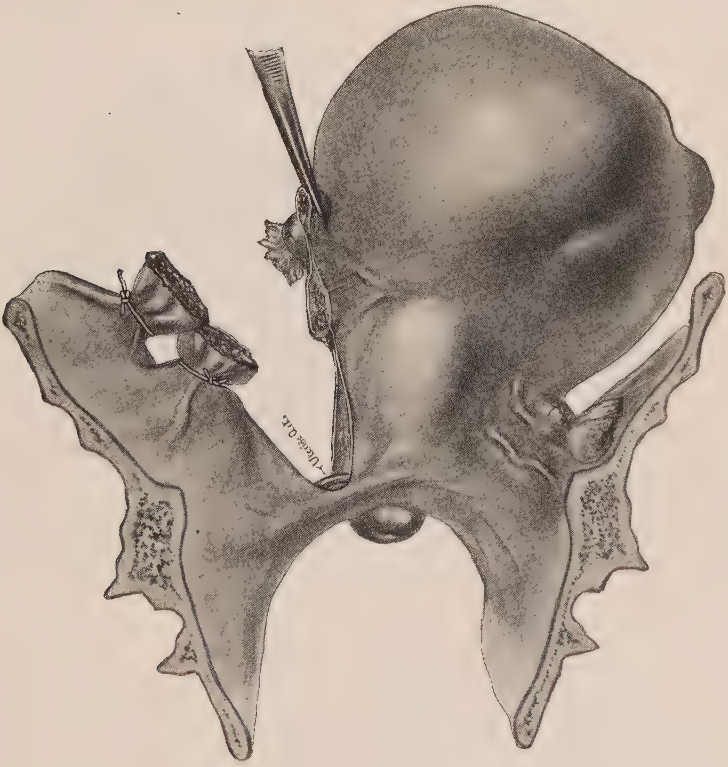


FIG. 519.—Supravaginal Removal of Myomatous Uterus.

thread is applied similarly on the opposite side. Both are tied, thus controlling the uterine arteries. The tumor is removed horizontally just above the ligatures, and leaves only a pedicle which is split in the median line and as much cut away from each side as possible, leaving only enough to hold the ligatures. The long ends of these are seized with the forceps and drawn downward, the peritoneal flaps sutured together with catgut, and the abdomen closed. The Pyror-Kelly modification of the operation consists in the ligation of the ovarian vessel and round ligament and the division of the ligament upon one side. An anterior peritoneal flap is formed and the peritoneum and bladder stripped down. This exposes the uterine artery and veins, which are ligated by a ligature carried with a curved needle beneath them close to the side of the uterus, the organ is drawn to the opposite side, and the uterine vessels are divided. The uterus is cut across just above the vaginal junction. A pad of gauze is placed beneath the upper cut surface to prevent the intra-uterine discharges from escaping on the wound while the canal below is wiped out. When near the opposite edge of the cervix, the incision is carried up one to two centimeters so as to leave a thin shell of cervical tissue and to expose the uterine vessels at a higher level, where they can be tied more easily and with less risk of including the ureter. The uterine vessels are clamped and divided, the uterus is rolled over still further, the round ligament clamped and cut through. With still more traction the ovarian

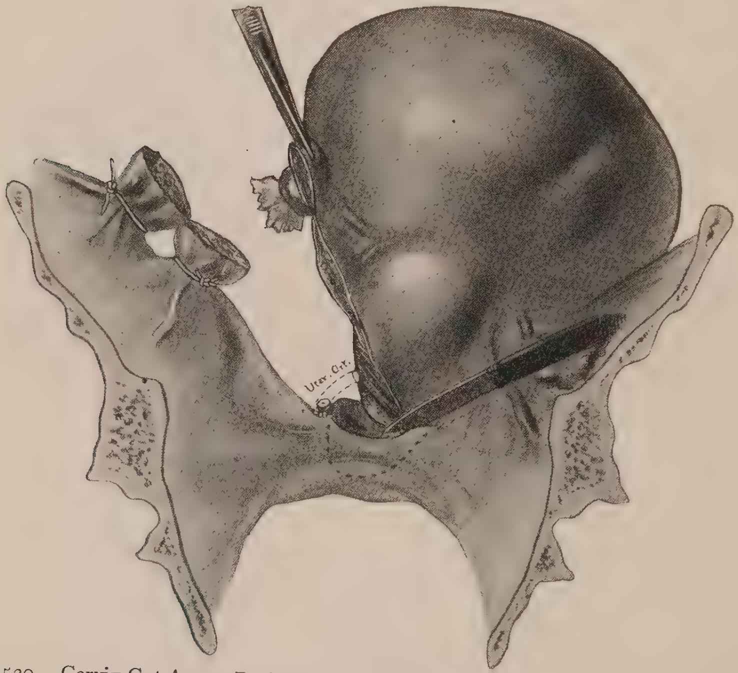


FIG. 520.—Cervix Cut Across Preliminary to the Complete Ligation of One Ligament.

vessels come into view, when they are clamped and cut and the whole mass becomes free. All clamped vessels are then tied. Kelly ties all important vessels twice—once during the enucleation and again after it is completed. The more expeditious procedure is to secure all vessels with clamps, separate the uterus and then proceed to the ligation. After control of the hemorrhage, the peritoneum is closed over the cervical canal by three to five catgut sutures. A lateral suture is passed on each side through the peritoneal surfaces and the broad ligament close to the cervix. The stumps of the broad ligaments are drawn into this and tied, thus securing the ovarian vessels by an additional ligature. The intervening peritoneal surfaces can be united by a continuous catgut suture, which should pass through the ends of the stumps to afford security against their being retracted. Where a large space has been left in the cellular tissue, it is advisable to unite the peritoneum with interrupted or mattress sutures, so that blood can run into the peritoneum and be absorbed instead of forming a hematocele. Bishop modifies the operation by removing the cervix entire. When the broad ligament is ligated, having reached the stage of ligation of the uterine artery upon one side, instead of cutting across the cervix he has an assistant push up the lateral culdesac of the vagina and cuts down upon it, and thus enters the vagina. With the scissors the vaginal wall is then cut through entirely around the cervix, which is bodily lifted up with the rest of the uterus and rolled over toward the opposite side. The cervix is seized with strong forceps and pulled up against the free surface of the uterus. It has been plugged previously and, consequently, gives no trouble from the discharges. He draws down into the wound a roll of iodoform gauze and closes the peritoneum over it. The abdomen is closed without drainage. This procedure affords a ready method of enucleating intraligamentary fibroids, especially if they are situated upon

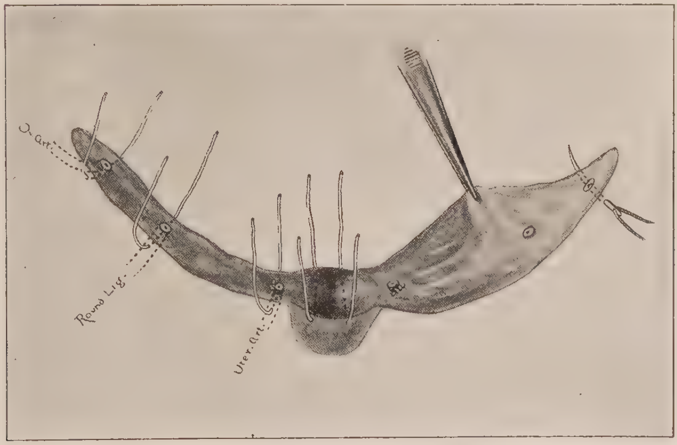


FIG. 521.—Stump Covered with Peritoneum.

one side of the abdomen. The entire removal of the uterus has another advantage, as there is no obstacle to drainage from the pelvis. E. C. Dudley claims that the union of the peritoneal flaps by transverse sutures permits the pelvic floor to sag down. Therefore he advocates the union of these surfaces by an anteroposterior line of suture. Where the cervix is left, a flap is made on each side. These are united, and over them the peritoneal flaps are drawn and secured by an anteroposterior line of sutures. The study of the evolution of any operative procedure would lead us to think that the originators of the plan studied to make it difficult. The constant aim of the operator should be to simplify procedures to secure the greatest expedition in the completion of the operation compatible with safety. Where the sides of the pelvis are equally accessible, the operator may prefer to proceed from above on each side. The vessels can now be secured, making sure that hemostasis is effective, after which the peritoneal flaps are united and the abdominal wall closed.

An effort has been made in the foregoing pages to present to the student a résumé of the various procedures for the treatment of myomatous growths of the uterus in order, that when he comes to treat the patient, he may not be doubtful as to which method may be most applicable. I feel it but proper to indicate what I believe to be the preferable method. The operative procedure just described affords a ready method for dealing with those intraligamentary tumors which occupy only one side of the pelvis, but where we have the uterus filled up with fibroid growths extending into the broad ligaments upon both sides and we cannot reach Douglas' pouch posteriorly, the problem for removal seems a most complicated one. The operation in such cases, can be performed expeditiously by making a vertical section through the uterus and tumor from the fundus downward, dragging the masses to either side as the incision is made. The intestines, of course, are held back by gauze introduced behind the tumor, while the bladder is rendered visible as we proceed in the division. In this way the entire uterus may be split down to and through the cervix, or, if preferred, each side may be cut through at the vagino-uterine junction, leaving the cervix as a simple stump. As the lower portion is drawn upward, the uterine artery becomes visible and is secured with clamp forceps. Further traction upon the mass rolls out the fibroid growths from the broad ligaments, and later renders visible the ovarian artery, which is also secured. The broad ligament is clamped external to the ovary and tube, and the mass removed. A similar course upon the opposite side leaves us with the uterine and ovarian vessels clamped ready for the application of the ligature.

The remaining steps of the operation may be completed as described in the previous operative procedures

12. *Panhysterectomy*, or total extirpation of the uterus, is the procedure of election in those cases in which the cervix has been taken up largely by the extension of the growth, or when it has been lacerated or is the seat of extensive disease. This operation may be performed by a number of methods:

I. The Method of A. Martin, of Berlin. With the patient in the dorsal position, the tumor is drawn out through a large median incision and, if necessary, made more movable by the enucleation of masses after the capsule has been split. The infundibulopelvic ligament is ligated and the broad ligament divided until the cervix is reached, beginning usually upon the left side, but in all cases on that in which the procedure would be most complicated. Having completed ligating one side before attacking the other, a pair of clamp forceps is applied on the uterine side of the line of ligature. The broad ligament is divided between the forceps and ligatures to the cervix. The uterus can then be brought over the symphysis pubis, the posterior fornix is cut through by scissors, close to the cervix, and the two edges of the wound united by sutures. Sometimes bent forceps are passed, and from the vagina made to tear through the posterior fornix into Douglas' pouch, and, by separating the blades, the structures are torn with less danger of bleeding. A ligature is passed around the lower attachment of the broad ligament on the one side, which is then divided. The os is seized with a pair of forceps, which both closes the cervical canal and draws the cervix upward and backward into the peritoneal cavity. The other side of the broad ligament can now be secured in a similar manner. The anterior vaginal fornix is divided, and the firmer bands of connective tissue one will meet in this situation. When these are cut through, the cervix separates easily from the bladder. Bleeding vessels are secured with the ends of the ligatures drawn down into the vagina. The peritoneum is united by transverse sutures over the vaginal wound, and the abdominal wound closed without drainage.

II. The Method of Christopher Martin, of Birmingham. With the patient in the dorsal position, he delivers the tumor through a median incision and packs gauze pads above and below. A double thread is passed through the broad ligament at the junction of its upper and middle thirds, and midway between the uterus and pelvic wall. These two sutures do not interlock. By pulling them forcibly inward and outward, the punctured aperture is torn with a transverse slit and the two ligatures are tied as far apart as possible and the intervening broad ligament divided. The same process is repeated on the opposite side. He prefers, where possible, to leave one ovary and tube. The other is removed with the uterus. A second ligature is passed through the broad ligament about the level of the internal os and nearer to the uterus than the first one. The aperture puncture is again stretched, when the ligature is tied as far apart as possible and the intervening tissue divided. The bladder is then separated from the anterior surface. He also advises the use of the sound in the bladder, to define its upper edge. A curved incision, two-thirds of an inch from the upper edge of the bladder, is made from one broad ligament to the other, and the bladder is stripped down. The surgeon can determine when he has reached the vagina by following the tip of a pair of forceps pressed into the anterior fornix. The vagina is opened upon these with scissors and the opening enlarged. The posterior fornix is treated similarly. The ureters, when seen, are pressed outward. The uterine arteries now remain to be tied. Ligatures are passed through the remaining portion of the broad ligament, hugging close to the mucous membrane of the lateral fornix of the vagina, and are tied upon either side. The uterus is cut loose, keeping the scissors as far as possible from the two lower sutures. The cut edges of the vaginal walls are drawn upward with forceps and carefully inspected. All blood-clots are sponged out of the pelvis and all bleeding points ligated. The ligatures may be cut short or may be left long and the ends used to draw the stumps into the vagina. The vaginal wound is not closed, but filled with a thick roll of iodoform gauze drawn through into the vagina. The abdomen is closed by interrupted silkworm-gut sutures. The gauze placed in the vagina is removed on the fifth or sixth day.

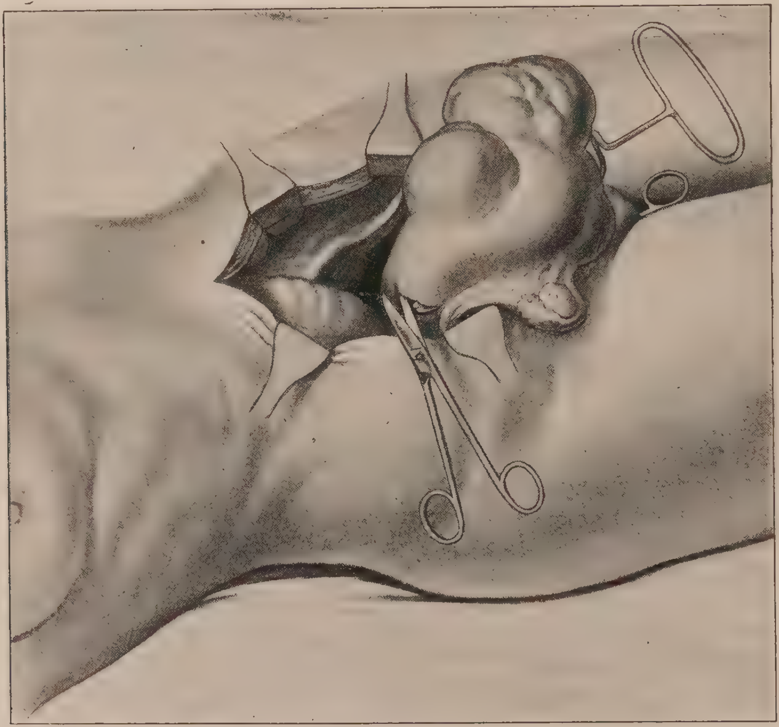


FIG. 522.—Panhysterectomy. Doyen's method. The tumor rolled out, incision made from Douglas' pouch into the vagina upon the end of a pair of forceps.

III. Doyen's Method. With the patient in the Trendelenburg posture, the tumor is lifted out through an abdominal incision and drawn forward over the pubes. A long, curved forceps, previously passed into the vagina, is made to project into Douglas' pouch, upon which an opening is made into the vaginal canal. (Fig. 522.) Through this opening the cervix is seized by the anterior lip, if possible, and drawn upward and backward. While held in this position, the entire circumference of the attachment of the vagina to the cervix is under view and can be divided by scissors. (Fig. 523.) The cervix is separated from the bladder by traction upward until the peritoneum above the bladder is reached. This is broken through and pushed back. The broad ligament external to the ovary and tube on the right side is clamped and incised with scissors. Clamp forceps are then applied to the broad ligament of the opposite side, when it likewise is cut through external to the ovary and tube. Frequently, by this method of procedure, the uterine arteries are not injured. The division is so close to the cervix that the main branch is not divided. Only the smaller branches are torn, and consequently do not bleed. The pedicles of the broad ligaments are ligated. The uterine arteries are also ligated and forceps removed. The vaginal mucous membrane can be united with the peritoneum by two or three sutures to prevent subsequent prolapse. The ends of the ligatures on the arteries are turned down into the vagina, and the pelvic peritoneum can be united by a purse-string suture across the pelvis, so as to invert the stump of the broad ligament below this structure. The abdominal wound is closed without drainage. Doyen, in his earlier operations, trusted to the angiotribe alone, but later applied a catgut ligature in the groove. The latter procedure is preferable.

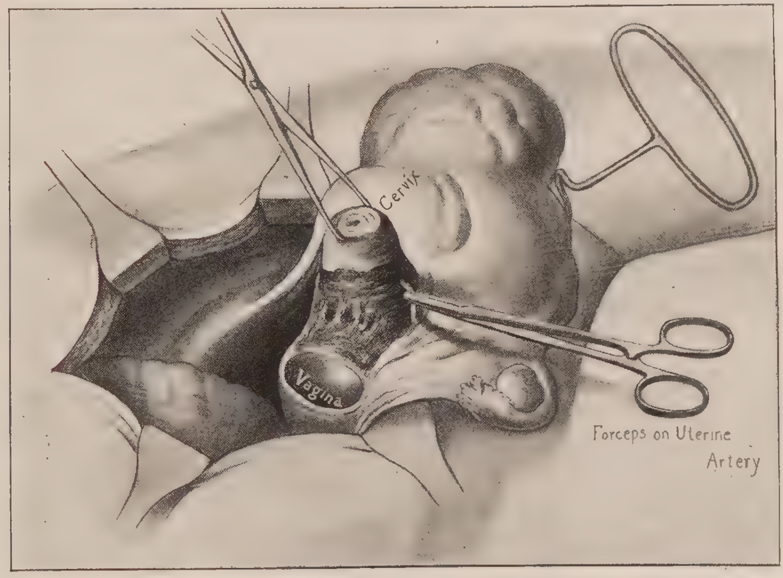


FIG. 523.—Cervix Separated from the Vagina and Being Pulled Away from the Bladder and Ureters.

IV. Schauta's Method. The tumor and uterus are drawn out through a median incision and the broad ligament on each side divided between clamp forceps. The anterior peritoneum is divided and, with the bladder, stripped down to the vagina; the tissues are clamped upon each side and the vagina opened right and left between the clamps and the uterus. The tumor is now held by the anterior and posterior vaginal walls, which are secured by curved clamps, and the uterus removed. Ligatures are substituted for the clamps, which are left long and employed for vaginal drainage. The abdominal cavity is closed by union of the peritoneal folds over the vagina.

V. Richelot, through an abdominal incision, first separates the anterior peritoneal fold and bladder. The uterine arteries are found, clamped by forceps, and cut close to the uterus. The anterior culdesac is found and opened; the cervix seized and drawn upward and forward. The cervix is separated from the vagina by a circular incision, and the broad ligaments are separated in sections from below upward. This plan affords an effective procedure when there are extensive adhesions following disease of the appendages. All the clamped vessels are securely ligated and the vaginal wound is closed with catgut.

For some time I have pursued the following details in this operation: After cleansing the abdomen and vagina, a roll of gauze is packed firmly into the latter with its end projecting. Through a sufficiently long median abdominal incision, the tumor is secured by a myoma screw and drawn over the symphysis. Each broad ligament external to the tube and ovary and the round ligaments are clamped and cut between the clamps and the uterus. The uterine ends of the ligament are clamped when the vessels bleed. An incision is carried through the peritoneum in front from one side to the other and the bladder is pushed down. The tilting of the fundus uteri to the left renders prominent the right uterine artery, which is clamped and cut after which the vagina is opened and separated from the cervix by cutting around the latter with scissors. Traction on the cervix now makes visible the left uterine artery from below. This is clamped and the remaining portion of the ligament cut, separating the uterus containing the growths. The vessels are now ligated separately or in mass with chromic catgut. Generally three ligatures are required on each side, one for each artery of the round ligament, and the ovarian and uterine arteries. A suture on each side is passed through the posterior peritoneal flap, hugs close to the edge of the cut vagina and is brought out through the anterior peritoneal flap. The stump of the corresponding broad ligament is drawn down and the ends of this suture tied over it, thus affording additional security against hemorrhage from the ovarian artery. The intervening peritoneal flaps are united by continuous suture, making sure that the end of each stump is secured by it to avoid the danger of retraction. The abdominal wound is closed by carrying a needle armed with a chromic catgut suture through the aponeurosis, muscle and peritoneum of the right side of the upper angle of the wound, through the peritoneum only of the opposite side and thereafter through the peritoneal edge until the lower angle is reached when it is brought out through the muscle and aponeurosis. Silkworm-gut sutures are now passed about three-quarters of an inch apart through all the structures above the peritoneum and temporarily secured with clamp forceps when the catgut suture unites the edges of the aponeurosis by a continuous suture until the upper angle of the wound is reached where it is tied to the original end of the suture, thus replacing the deeper structures with a single knot. The silkworm sutures are tied and the skin edges between them brought in apposition with plain catgut sutures.

In difficult cases Bishop employs what he calls the combined method, which may be begun either below or from above. In the former with the patient placed in the lithotomy position, the uterus is exposed by retractors, seized, and drawn down with vulsellum forceps. The cervix is cleansed, packed with gauze, and if there is much discharge, the os is closed by a suture. A circular or ovoid incision is then carried around the cervix, completely dividing the vagina, when, with the finger hooked closely to the uterus, the bladder is separated from the anterior surface of the uterus and well to either side. In large tumors this cannot be accomplished to a great extent, but should be done sufficiently to expose the uterine vessels. Douglas' pouch is opened, and, with the one finger behind and the thumb in front, the uterine artery should be defined, ligated, and the ligament cut as far as the ligation extends. Hemorrhage is controlled carefully and the vagina packed loosely with gauze. The patient is then changed to the Trendelenburg posture and the abdomen opened through the rectus sheath of one side. All adhesions to omentum and intestine are separated, and ligatures applied where indicated. A gauze pad is placed over the intestine. When the ovaries and tubes are healthy, they are to be left. When diseased, part of the ovary at least is retained. One ligature is made to embrace the ovarian ligament, if the tube and the round ligament near the appendages are healthy enough to permit of their being retained, and is tied as near to the uterus as the retention of the ligature will permit. The ligament is cut close to the side of the uterus. The lateral incisions are joined by a curved incision anterior to the uterus, about half an inch above the line of the bladder, which is stripped down until the previous separation has been reached. The uterus is now attached only by the central portion of the broad ligament upon each side, which is ligated and the uterus cut away. Bleeding vessels are ligated and the ligatures cut short, the pelvis dried, a roll of gauze pulled through into the vagina, and the peritoneal flaps closed over it with a continuous catgut suture. All raw edges are carefully inverted into the vagina, so that the peritoneal wound is perfectly smooth. Bishop closes the abdominal wound with catgut for the peritoneum, *crin de Florence* for the aponeurosis, and horsehair for the skin. With the insertion of the last layer, the skin should be cleansed, dried, and painted with celluloidin, which forms an air-tight covering.

Bouilly preferred to begin from above and finish from below. He delivers the tumor through the median abdominal incision with the patient in the Trendelenburg posture, divides the broad ligament between double ligatures, incises the peritoneum in front of the uterus, and pushes down the flap with the bladder, ligates the broad ligament so as to include the uterine arteries, amputates through the cervix, and closes the abdomen. Then, with the patient in the lithotomy position, he removes the cervix per vaginam, sutures the peritoneal flaps from below, and plugs the vagina with gauze. This procedure is particularly valuable in a sloughing fibroid which communicates with the vagina.

Summary. Notwithstanding the recent able contributions to the literature of this subject, in which the writers advocate radical measures, I remain convinced that in the great majority of cases the aim of the surgeon should be to save and not sacrifice. A hysterectomy, partial or complete, should be his practice only when it is impossible to preserve a functionating uterus. In submucous growths, with hemorrhage as a marked factor, the tumor, when accessible, should be removed by torsion or excision of its pedicle. When the tumor is still within the cavity of the uterus, the cervix may be dilated with laminaria tents. If sufficient room is not secured thus the os can be split by a lateral or an anterior incision, as may be most convenient, and the tumor removed by torsion, by excision of its pedicle, or by enucleation. If the tumor is too large to permit of its ready extirpation, it should be removed by morcellation. Vaginal hysterectomy should be confined to uteri containing growths which are not too large to permit of their ready passage through the vagina, and yet in which the uterine structure is so taken up and involved as to preclude the retention of a healthy organ, or in which the ovaries and tubes are secondarily involved, making the retention of the uterus after the removal of the growths of no value. Of the various abdominal operations, myomectomy, enucleation of the growth, or partial or complete hysterectomy can be performed. The principle already enunciated, that no organ should be sacrificed whose function can be maintained, must govern as well in the abdominal as in the vaginal procedures, and when the ovaries and tubes are in a condition to justify the retention of the uterus, myomectomy or enucleation should be practised, even though a number of growths are present.

The above was written five years ago, but candor obliges me to admit that several of the patients from whom I enucleated growths have had recurrence, particularly where a number of growths were removed. In the light of this experience, I believe it is better to do hysterectomy in a woman over thirty-five years of age whose uterus contains a number of growths. The objection to enucleation frequently advanced, that the cicatricial changes in the uterine wall which will result from the enucleation of a number of growths will unfit the organ for the exigencies of gestation, labor, and the puerperium, would seem to be valid and can be combated only in the line of experience. To contribute to this service I would relate the history of the following patient: A Japanese woman, aged thirty-three years, a patient of Dr. A. B. Shimer, of Atlantic City, was sent to me in February, 1903, because of an abdominal tumor. An irregular nodular mass was found in the median portion of the abdomen, projecting two inches above the symphysis and a little to the left. Careful physical examination made it manifest that it was a part of the uterus and that it filled up the pelvis. Hysterectomy was advised. She entered St. Joseph's Hospital the latter part of April, 1903, when the growths were exposed by abdominal incision. They were found so situated in the anterior and posterior walls of the uterus that enucleation seemed possible. The growths, thirteen in number, were enucleated, but without opening into the uterine cavity. The anterior wall of the uterus was much mutilated, but was quilted together, producing a satisfactory looking organ. To prevent the uterus from falling back into the pelvis the fundus was secured to the abdominal wall by two turns of the continuous catgut suture closing the parietal peritoneum. She developed an infection of the abdominal wound from which considerable pus was discharged. Four weeks following the operation a slough was removed from the depths of the wound, which contained the catgut sutures employed to close the uterine wound, after which the recovery was rapid and the patient was discharged cured. A communication from Dr. Shimer, dated June 16, 1906, informs me she was married on the fourteenth of October, 1903, and in November, 1904, gave birth to a healthy child weighing seven and one-half pounds. As the presentation was a vertex in an occipitoposterior position, the delivery was instrumental. Subsequent to her delivery her health was excellent. In a second labor she went into a collapse and died, with symptoms indicating possible uterine rupture and internal hemorrhage. A number of instances have been reported where examination has revealed unsuspected malignant degeneration complicating the tumor; also reports of recurrence in the stump, the danger of which is lessened by panhysterectomy. Another disputed question is whether the ovaries shall be removed or one or both be retained. Those who advise the retention of an ovary claim that its preservation prevents the distressing symptoms associated with the premature menopause. I formerly practised the retention of ovarian stroma whenever possible, but such unused organs atrophy early, and the distressing phenomena become just as acute. Not infrequently will it be found necessary to reoperate because of neoplastic changes in the ovary. In many cases the changes in the tube and ovary already exist, making the removal of these organs desirable. When the uterine structure is greatly involved or when ovarian, uterine, or tubal disease complicates the condition, the operator may be forced to resort to either partial or complete hysterectomy. My experience inclines me to advise complete hysterectomy, for the retention of the cervix affords no special advantage. Its complete removal does not add to the difficulty nor prolong the operation. It affords better drainage and expedites the recovery of the patient. In nearly all cases the clean removal of the uterus, ovaries, and tubes is more readily accomplished than is the retention of an ovary. No one operation can be made applicable to every patient. In the majority the method I have described on page 835 will prove the most satisfactory. When the broad ligaments are shortened by inflammation and the pelvis filled up by myomata, the operator may be unable to reach the cervix, or work down on either side, when, of course, another method of procedure must be chosen. The uterus containing the growths may be divided by vertical section, and through the culdesac portions of the tumor mass can be enucleated, thus decreasing the size of the structure and affording more room. Proceeding from below upward intraligamentary growths are shelled out with but little danger to the ureters, and better facility is afforded to secure hemostasis. Where access to one side of the pelvis is partially barred by inflammatory shortening or the ligament is occupied by myomata, the Bishop modification of the Pryor-Kelly operation permits ready removal of the uterus and growths.

313. Accidents during Operation. Hemorrhage is an accident which is avoidable with careful application of ligatures. Where the tissues are ligated *en masse*, the angiotribe, by compression of the tissue, forms a groove in which the ligature may lie with less danger of its loosening. Where the ligated mass is large and vessels are greatly distended, it is prudent to place a second ligature back of the first upon the more important vessels. The compression furnishes a button over which the ligature is unlikely to slip. When the cervix is retained, bleeding from the stump is avoided by applying ligatures upon each side to control the blood-supply from the uterine arteries. One advantage of the entire removal of the uterus is that hemorrhage, when it occurs, is at once revealed by its discharge from the vagina. Internal hemorrhage will be indicated by symptoms of increasing shock, and the occurrence of such symptoms should be considered an indication for prompt reopening of the wound to secure the open vessel, for, should the patient rally from the hemorrhage, the large accumulation in contact with the intestine in the weak state of the patient adds to her subsequent danger from the possibility of sepsis. All bleeding vessels should be secured firmly before the peritoneal wound is closed. Care must be exercised in short broad ligaments that the ovarian artery is not retracted behind the peritoneum from the grasp of the ligature, there to produce a concealed hemorrhage or thrombus which may become so large as to open into the peritoneal cavity.

In the injuries to the hollow viscera the bladder is most likely to be affected, as it is often drawn up by the growth and is closely attached to its anterior surface. Its relations to the uterus and tumor will depend largely upon the situation of the growth. A tumor which has originated in the lower part of the anterior wall of the uterus may readily drag up the bladder and cause it to be displaced upward. The bladder may be displaced to one side, and not cover the anterior surface of the uterus and tumor. This may occur because of partial torsion of the neck of the uterus or from the size of the growth. In one case I accidentally incised the bladder when opening the abdomen, as it was displaced upward and to the left side and formed a distinct tumor that did not disappear entirely after the employment of the catheter. The opening was sutured immediately, the bladder separated from the surface of the growth, and the recovery of the patient was unretarded. Inflammatory adhesions may bind the bladder to the anterior surface of the tumor, and in the subsequent development may drag it so high that it is overlooked in the separation of adhesions. In such a way I was so unfortunate as to incise the fundus where adhesions were extensive, involving both anterior and posterior surfaces. In this patient recovery took place after the bladder wound was sutured. When the bladder is injured, the wound should be closed at once by sutures, whether it occurs upon the peritoneal or on the nonperitoneal surface. In the use of the sutures precaution should be exercised that they do not enter the vesical mucous surface. It is well to have a double row of sutures, in order to bring a larger surface of bladder-wall in apposition. In the subsequent convalescence the bladder should be frequently evacuated. When the wound has been extensive, it would be advisable to employ a permanent catheter for the first week, and for the second week to have the urine drawn at frequent intervals. The possible displacement of the bladder by the growth should always be considered, and care should be exercised to avoid its injury.

Injuries of the Ureter. The situation of the ureter beside the cervix makes it particularly vulnerable in the removal of large fibroid growths, especially where the growth has developed low in the broad ligament. In some cases the growth shoves the ureter upward until we find it in a groove between the tumor and the uterus. In such patients the dissection should be practised most carefully in order to avoid injury to the ureter. The Doyen operation lessens the danger to both bladder and ureter; the cervix is pulled away alike from the bladder and the ureters. In the intraligamentary variety the tumor is dragged away from its relations to the ureter. In cases of injury, and particularly where the ureter has been cut, the proper course would be:

1. To establish an anastomosis between the ends of the divided ureter. (Fig. 249.) The union can be end to end, the cut surfaces being made oblique. Another method is to split the vesical end and scrape the mucous surface and insert the renal end, securing it by sutures.

2. Transplantation of the renal end into the bladder. (Fig. 248.) In introducing the ureter, it is important that it should be anchored in the bladder in such a way as to prevent it slipping back or drawing away from its attachment to the bladder surface, which would permit the urine to escape into the peritoneal cavity. If the union with the bladder is difficult, because the injury of the ureter is situated so high that the latter reaches the bladder only upon slight stretching, it is better to anchor the bladder to the side of the pelvis at a higher level, so that no traction shall be made upon the shortened ureter. When the ureter is too short to permit of an anastomosis with its vesical end or its transplantation into the bladder, the following alternative procedures have been suggested.

3. Carry the ureter across and anastomose it with the ureter on the opposite side. This procedure in my judgment is only mentioned in order to be condemned. The ureter if long enough to permit this, should be introduced into the bladder. I should hesitate about imperiling the patient by disturbing the remaining conduit.

4. The introduction of the ureter into the corresponding colon. This operation has not been attended with very satisfactory results. The infection and gases from the intestine have been known to be carried through the ureter to the pelvis of the kidney, producing fatal inflammation. The contact of the urine with the intestine will cause considerable irritation and produce a marked diarrhea.

5. Bring the extremity of the ureter out through the abdominal wound or make a fistulous opening upon the skin surface. The preferable position for the opening is through the triangle of Petit in the loin. A fistula on the anterior abdomen is attended with no little discomfort to the patient, as the constant soiling of her person and clothing with urine is

distressing to a cleanly patient and annoying to those who have to be associated with her. The lumbar fistula, however, permits the urine to be collected without such discomfort. Probably still better is a nephrostomy by which the urine can be collected directly from the pelvis of the kidney. Watson, of Boston, has recounted cases who have lived comfortably for years with both kidneys drained thus.

6. Ligate the ureter and drop it back. This ligation should be made by a double ligature, for the reason that, under the process of pressure-atrophy, the ligature becomes loosened and, when single ligatures are used, the urine escapes into the peritoneal cavity and causes urinary infiltration and septic peritonitis. This condition is less likely to occur when a second ligature is applied from half an inch to an inch above the first. The urine continues to be secreted until the pressure within the cavity of the kidney is equal to the blood pressure, when the secretion is arrested. In such cases the kidney, unable longer to secrete the urine, becomes a useless organ and atrophies, while the extra work is taken up by the remaining kidney. The result of the procedure, of course, will depend, as it would in nephrectomy, upon the condition of the remaining kidney.

7. Removal of the kidney.

Injuries of the intestine are less frequent. They may occur as a result of extension and firm adhesions to the surface of the growth. The injury is more apt to be found in the sigmoid flexure of the descending colon and the rectum. As a result of chronic inflammation, the adhesions may be extensive and firm, and lead to injury of the intestine before the possibility could be suspected. I operated on a patient who had carried a fibroid as large as a pregnancy at term, for eighteen years. When I opened the abdomen the small intestines were firmly adherent over the tumor to such an extent as to forbid either their dissection from it or resection of the intestine. I split open the tumor and *trimmed out its inside*, then sutured together the shell with the intestine attached. The patient had an uninterrupted convalescence. In all cases of extensive adhesions, after the removal of the growth careful examination should be made to ascertain the existence of intestinal injury. Such adhesions may also result from complications incident to suppurative disease of the tubes associated with the growth. Very frequently an opening will occur between a tubal abscess and a knuckle of intestine through which the contents of the abscess have been partially drained. During an operation for the removal of a fibroid growth associated with pelvic suppuration I found an opening from a left tubo-ovarian sac into the anterior surface of the sigmoid, through which the thumb could be introduced. This sinus had served to empty the abscess at frequent intervals. In closing an intestinal opening its edges should be trimmed carefully and thus remove tissue of low vitality or such as has been injured during the procedure, and secure contact of the surfaces by a double row of sutures. Continuous chromic catgut suture is a very serviceable material, but, as has been previously mentioned, the suture should be so introduced as to hold extensive surfaces in apposition. The patient should be kept subsequently upon an albuminous broth diet, and early evacuation of the bowels should be accomplished, affording no opportunity for hard fecal masses to form in this portion of the intestine. In these inflammatory fistulous cases gauze packing drainage is advisable generally, for it is always difficult to make certain that all tissue of low vitality has been excised and that a fistulous opening may not recur. When the abdominal wound is closed, leakage may cause fatal infection of the peritoneal cavity before the gravity of the condition is recognized. If a small fistulous opening follows in such a case, it is preferable to keep the wound open and the cavity cleansed thoroughly by frequent irrigation both by the rectum and the abdominal wound, and to permit nature an opportunity to close the opening by granulation. Nature soon shuts off the tract of the general peritoneum and prevents the possibility of its infection. To reopen such a wound in order to close the fistula increases the danger of general infection. Where the caliber of the intestine is free and unobstructed, a fistula will close by granulation, but should the intestine be obstructed or kinked below the fistula, the latter will not close. The effect of a fistula will depend upon its size and position in the intestinal tract. Free discharge from the intestine high up means that much nutritive fluid is removed from the processes of absorption. Therefore a corresponding loss of vitality results. A fistula in the large bowel may exert but little influence upon the general nutrition.

314. Causes of Death Following Hysterectomy. The most frequent causes of fatal results are: shock, hemorrhage, and septicemia. Shock is a vasomotor disturbance which may result from severe hemorrhage during or preceding the operation. It is especially prone to occur in individuals in whom the percentage of hemoglobin is small. It is promoted by prolonged operations, injudicious administration of anesthetic, exposure of the viscera to cold, or drying in the atmosphere. It is more likely to occur in the neurasthenic and poorly nourished, in victims of tuberculosis, or in patients who have been suffering from prolonged inflammatory complications. In fibroid growths complicated by dense inflammatory adhesions the traction upon important sympathetic ganglia in breaking up adhesions may be attended by fatal shock. Hemorrhage may be the cause of death during or shortly following an operation, from rupture of a large artery or vein, or from failure to control bleeding during the procedure. These occurrences should be rare, as the operator and his assistant should be alert to secure vessels before they are injured or upon the first spurt when the vessel is severed or torn. A fatal hemorrhage may result from retraction of an important vessel or from slipping and loosening of an insecurely placed or tied ligature. This is more likely to occur when the pedicle is short and thick and is tied *en masse*. Unless the gravity of the condition is appreciated at once, the hemorrhage may be fatal rapidly. If the enfeebled condition of the patient leads to the formation of a clot and arrest of bleeding, the large accumulation of blood in the peritoneal cavity may still be a source of danger to the patient through its infection by its contact with the intestine or from pathogenic germs which may have been left in the abdominal cavity. In this sense it may furnish the cause for the subsequent death of the patient from septicemia. The danger from septicemia is greatly enhanced where the operation has been difficult, due to intraligamentary growths; when the operation has been complicated by extensive adhesions, suppurative processes in the tubes, and hematoma of the ovaries. Less frequent but none the less to be regarded as causes are pneumonia, pulmonary embolism, ileus, tetanus, and secondary manifestations of sepsis, as phlebitis. (For after-treatment see Sections 150–164.)

PUERPERAL TUMORS.

315. *Physometra*, an unusual form of enlargement of the uterus, giving the appearance of a tumor, is an accumulation of gas in the interior of the uterine cavity. This affection may be produced during the puerperium or without it. After the woman is delivered the uterus is large and air will enter it. If expulsion is delayed by ineffective contraction of the organ, in the course of convalescence the placental fragments or retained portions of membrane undergo decomposition and produce a putrid gas, which, by larger accumulations in the organ, produces the condition known as physometra. It may develop in the nonpuerperal uterus, as is well indicated in the following patient, as cited by Auvard: A negress, forty-six years of age, reached the menopause and presented considerable abdominal enlargement. Her periods had not been seen for three months. According to her calculation, she was certainly pregnant. The term had passed four months. She called a physician and arranged that he should attend her in labor. Under an attentive examination of the patient to determine the cause of the uterine enlargement a sound was introduced into the cavity of the uterus, when, in less than a minute's time, an offensive gas was driven out with great impetuosity. After this evacuation the uterus returned to its normal proportions and the patient recovered. In the acceptance of this condition we must admit the possibility of the secretion of gas in the uterine cavity, or the putrefaction of retained intra-uterine débris after the occlusion of the cervical canal. Decomposition of the débris results in the formation of gas and the distention of the organ. The treatment consists in the establishment of the permeability of the canal.

316. **Hydrometra** is due to any cause by which the internal orifice of the uterus becomes closed and the secretion retained in a woman who suffers from amenorrhea or in one suffering from endometritis after the climacteric has occurred. It practically produces a mucometra, or, when the liquid is serous and clear, it is denominated hydrometra—a term which includes all seromucous uterine collections. If the endometritis is purulent, we have a pyometra. Hydrometra is exceedingly rare.

317. **Hematometra** is an accumulation of blood in the interior of the uterus, and has been described under malformations.

318. **Pyometra.** Pyometra is an accumulation of pus in the uterus, and is more likely to be found in women some years after the climacteric.

319. **Hydatid cysts of the uterus** is, however, a condition free

from the presence of hydatids. There are a large number of cysts, which form in the mucous membrane of the uterine cavity—generally following labor or abortion, and known as cystic mole. The condition is so closely associated with that known as deciduoma malignum that its consideration will be postponed until the discussion of the latter disease.

320. Mucous polypi of the uterus are growths which arise from the uterine mucous membrane, and are distinct from the fibroid polypi, with which they are often confounded. (Fig. 521.) The latter arise from the muscular wall and push the mucous membrane before them.

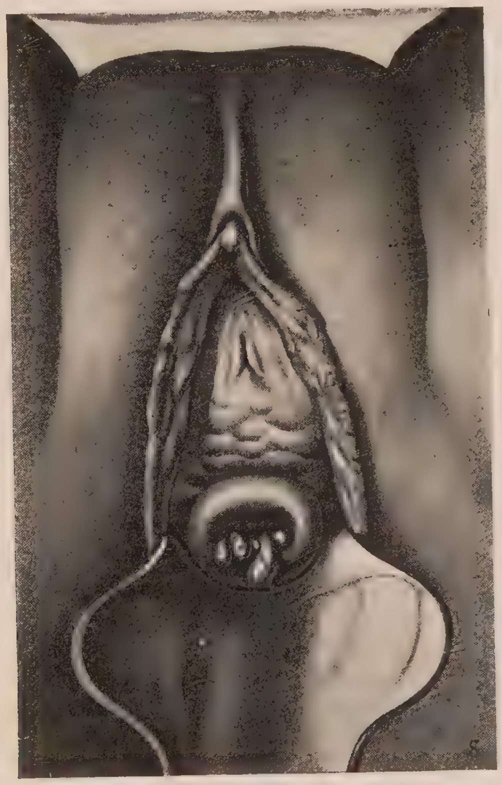


FIG. 521—Mucous Polypi.

The former result from hypertrophy of the glandular structure of a limited portion of the uterus, which causes them to push out and form a polypoid growth. A number of these may occur within the cavity of the uterus and interfere with the performance of its functions. They are associated with endometritis. They are due to a localized inflammation and hypertrophy of the glandular tissue. These growths may vary from the size of a filbert or less to a growth consisting of a grape-like cluster of glands attaining the size of a small orange, which is extruded from the cervix and hangs by a pedicle from the uterine cavity. They may occur upon any part of the mucous membrane; frequently they arise from the cervix and protrude from the os in small masses. The treatment is the same as that of the inflammation with which they are associated: thorough curetment of the uterus; removal of the growths; disinfection and sterilization of the uterine canal, and gauze packing to promote subsequent drainage. The operation should not be devoted to the removal of the growths only, as the cervical canal is likely to become irritated and cause subsequent pelvic inflammation.

Another form of uterine tumor is *placental polypus*, which consists of a mass of coagulated blood, in association with a portion of the placenta or the decidua. It hangs by a pedicle from the uterine cavity and acts as a source of irritation until its removal. The mass becomes compressed in the uterine cavity and forms a firm growth, which subsequently may become partly organized, or, under the influence of insufficient nutrition, may become decomposed, and cause putrid intoxication. Treatment will consist in the thorough removal of the growth. This can be done with the finger or by the introduction of forceps, which seize and twist off the tumor.

321. Malignant tumors, as seen by our classification, originate in embryonic tissue and are divided, according to their origin, into two classes: the epithelial and the connective tissue. They differ from the benign tumors in having no limit to their growth and extension. A malignant tumor is one which destroys the organ in which it originates and penetrates to the surrounding structures without respecting the barriers which nature may erect against its growth. There is no tissue of the body which can offer effective resistance to its encroachment. Malignant growths are further characterized by a tendency to extend themselves to remote tissues and organs by transmission through the lymph- and blood-vessels. Loosened pieces of tissue are washed away from their original source to new locations, thus affording development to new foci of a structure similar to that from which they originated. A further characteristic is that they exhibit a disposition to recur after removal. The demarcation between malignant and benign tumors is difficult to fix. Thus, papillary ovarian cysts may rupture and subsequently implant themselves upon and infect the general peritoneal cavity. Syphilis and tuberculosis manifest an inclination to extend to the surrounding structures and to be reimplanted through the blood-vessels. But the manifestations of syphilis and tuberculosis are capable of modification, of arrest, and even cure. The papillary infection generally undergoes atrophy and disappears when the original source of infection has been removed.

Pathologic classification of malignant disease of the uterus can be arranged as in other organs of the genital tract, in tumors springing from the embryonal epithelial cells, of which there are two varieties, namely: carcinomata and chorio-epitheliomata, and from the embryonal connective-tissue tumors, of which there are also two varieties of malignant disease, namely: sarcomata and endotheliomata. Carcinomata may develop from any portion of the uterine mucous membrane between cervix and fundus, and in either from the surface epithelium or that lining the glands. Chorio-epithelioma develops in the second layer of cells, known as Langhans' cells, covering the chorionic villi. Sarcoma may originate in the connective tissue of the endometrium or in the tissue of the mural portion of the organ. Endothelioma develops from the endothelial cells of the lymph-vessels, blood-vessels, and the serous covering of the uterus. Furthermore, as a rule, it has no alveolar structure.

Anatomic Classification of Carcinoma. Carcinoma may arise from any portion of the mucous membrane lining the uterus or that covering the cervix external to the os, the latter being the portion denominated by the Germans the portio vaginalis. According to the anatomical location, carcinoma is classified as: 1, Carcinoma of the vaginal portion of the cervix, that portion between the external os and the vaginal vault; 2, carcinoma of the cervical canal, which is bounded below by the external os and above by the internal; and, 3, carcinoma of the corporeal mucous membrane, whose inferior boundary is the internal os. Carcinomata are further divided histologically into squamous-cell carcinoma and cylindric-cell carcinoma or adenocarcinoma. Squamous-cell carcinoma is the form of disease found in the epithelial covering of the vaginal portion of the cervix. In rare instances it has been found in the endometrium of the uterine body, and its origin explained by the presence of parasitic epithelial cells; but later investigations demonstrate that it more probably had followed metaplasia of the surface epithelium from long continued irritations. Cylindric-cell cancer develops from the epithelial covering of the mucous membrane, but with greater probability from the epithelial cells lining the glands of the cervix and also in the tubular glands of the uterine body. Of the different anatomic varieties, the squamous-cell-carcinoma of the portio vaginalis is the most frequent. Next in order of frequency is the cylindric-cell cancer of the cervical canal, while the least frequent is the cylindric-cell cancer of the uterine cavity. Carcinoma of the uterus ranks in frequency next to cancer of the stomach. In 31,482 cases of carcinoma Welch found 29.5 per cent. were of the uterus. Williams estimates that death from cancer in women over thirty-five years of age is one in thirty-five. In a survey made by Dr. P. B. Bland of the vital statistics of the city of Philadelphia extending over a period of twenty-five years, from 1878 to 1903, 9777 women were found to have died from cancer. Of this number, 3172 were attributed to cancer of the uterus, 2139 to cancer of the stomach, and 1776 to cancer of the breast. During this period 1980 men died of gastric cancer, making a total from cancer of the stomach in males and females of 4119. These statistics demonstrate that cancer of the uterus is by far the most common form of malignant disease, and account for the fact that twice as many women as men die from cancer. The squamous-cell form carcinoma is by far the most frequent malignant disease of the uterus—more frequent, indeed, than adenocarcinoma of the cylindric form of disease in both the cervix and body. The squamous-cell variety develops from the atypical proliferation of the squamous epithelium covering the vaginal portion of the cervix. In women who have borne children and in whom repeated lacerations of the cervix have occurred, metaplastic changes in the epithelium may lead to an extension of multiple-layered epithelium some distance into the cervical canal or even into the body of the uterus. This explains the occasional existence of apparent squamous-cell-carcinoma within the cervical canal and body, and accounts for the mixed forms frequently present.

322. Development of Squamous-cell Carcinoma. This form of malignant disease may develop on the anterior or posterior lip of the cervix or frequently on the site of an old laceration. Cullen distinguishes three stages, according to the degree of infiltration and disintegration of the part affected:

1. A rapid proliferation of the squamous epithelial cells. The lesion appears first as small, papilla-like nodules, hard at the base, more or less friable on the free surface, which bleed easily on examination. They present a glistening, bluish-white appearance on the surface, and on section two zones are recognized—the first or peripheral is composed of a more or less friable, brain-like consistence and of a yellowish-gray, brain color. The second or basal zone lies in juxtaposition to the cervical tissue, is of a yellowish-white color, and of a dense, cartilaginous consistence. Close inspection of these nodules reveals fibrous striations or trabeculæ occurring throughout their tissues. These bands surround or isolate nests of friable homogeneous tissue, the so-called cancer assemblages or cancer nests. These areas may be emptied of their contents by compressing the tissue, and small shallow depressions remain. It is important that such areas be not confounded with dilated cervical glands containing inspissated mucus—the so-called Nabothian cysts. The small papillary projections or processes manifest in the nodules grow and spread rapidly, forming a large cauliflower-like mass. Such a neoplasm has been designated the cauliflower cancer. In this stage the disease may be so extensive as to fill the entire vaginal vault. The extension of the papillary process into the vaginal wall appears a determination of the malignant disease to follow nature's law and travel in the line of least resistance.

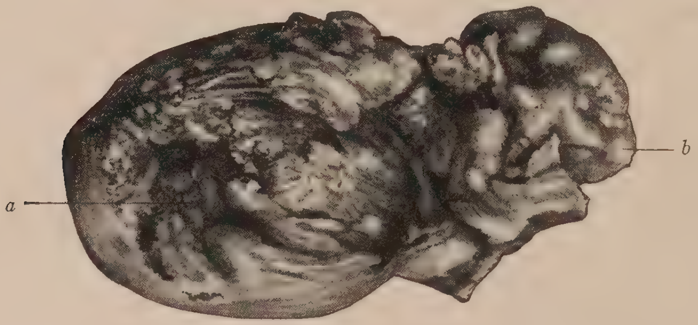


FIG. 522.—Squamous-cell Carcinoma of Cervix.
a, Cervical canal; *b*, portion of vaginal wall involved in the malignant process.

While this external proliferation occurs, there is a simultaneous invasion and consequent involvement of the subjacent tissue, which becomes dense, hard, and indurated. Section of this nodule reveals the neoplasm appearing as a hard, cartilaginous, yellowish-white growth extending upward toward the internal os, and outward toward the vaginal vault, and later, also, in the direction of the parametrial tissue. Such neoplasms, when closely inspected, disclose glistening trabeculæ of fibrous tissue, constituting the stroma, which form the walls or spaces in which assemble the parasitic epithelial cells. Thin sections made from such an area when compressed and washed out present a sieve-like structure. It is unfortunate that squamous-cell epithelium in this stage so frequently is undiscovered. It is rare, indeed, and usually only by accident, that the disease is recognized in this formative stage, for it is then wholly devoid of symptoms. It is self-evident that radical treatment in this stage would afford better results than are now obtained, because the disease then rarely has been projected beyond the uterus.

2. A stage of moderate disintegration, of decided symptoms, and a period when the disease most frequently comes under operation. The palpating finger at this period will discover partial or total destruction of the cervix, and substituted therefor an irregular, cauliflower, fungating mass of tissue of a grayish-yellow color, friable and brain-like in consistence. The tissue breaks down under manipulation and bleeds freely. Instead of the cauliflower mass, which may have disappeared by sloughing, a large, irregular, crater-like ulcer exists, the floor and sides of which are irregular, hard, and covered with a sloughing, gangrenous tissue. The disease will be recognized as having invaded the structures beyond the cervix, and the latter organ may have been to a great degree destroyed. After the removal of the uterus, the base of such an ulcer appears to be composed of a yellowish-white, hard, cartilage-like tissue. This tissue ramifies the structure of the cervix by finger-like projections, as in the cauliflower growth. The disease extends, involving the vaginal vault and connective tissue of the broad ligaments.

3. The final stage is characterized by extensive or complete disintegration of the cervix and involvement of the circumjacent structures. Cancer in this stage is usually recognized from the history and physical symptoms alone, without a vaginal examination. Palpation reveals an entire destruction of the cervix, and at its site a cone-shaped, sloughing, crater-like cavity. This has been described by some as resembling the cavity of a decayed molar tooth, its walls and floor covered with necrotic tissue. In palpation the tissue feels hard, granular, and presents numerous elevated nodules due to the presence of these finger-like processes. The disease reaches first that portion of the vaginal wall most contiguous to the original nodules. Generally the sides are first involved, then the anterior, and lastly the posterior, wall. With the invasion of the parametrium the broad ligament becomes hard and dense, the bladder adheres to the uterus and the wall is infiltrated. The ureters are frequently surrounded by masses of this infiltration, and finally become involved therein. Fistulous communications may follow between the vagina and bladder and

rectum. The disease may extend upward into the cervical canal as well as outward, but this course is less frequent.

Histology of Squamous-cell Carcinoma. The histologic picture of cancer depends upon the stage at which it is subjected to microscopic study. In primary proliferation and induration prior to disintegration, several characteristic elemental changes are observed. The tissue secured for study should be so excised as to secure both healthy and diseased tissue, and the sections made therefrom should include both. The section of this tissue near the margin of the growth appears under the microscope similar to tissue showing a reactionary inflammatory change. Small round-cell infiltration and polynuclear leucocytes are present. As the edge of the neoplasm is approached, disturbances will be noted in the squamous epithelium. These occur in the form of piling up or proliferation outward of the cells. Occasionally a superficial loss will be seen, but always is seen an ingrowth or dipping down of the cells in cone-like processes into the cervical tissue. The mucous covering of the cervix, as a rule, remains intact until the growth is well advanced. Invasion of the parasitic cells is not limited to a single line of the stratified squamous epithelium, but all layers take part in the process and the normal basal layer of large cuboidal cells forms the boundary of the advancing column. Should the section extend through one of the finger-like processes, these cuboidal cells will form the outer zone. External to the line of cuboidal cells are finger-like projections surrounded by a network of fibrous tissue, which contains some muscle-fibers and is known as the stroma. Areas of keratinization or hardening of the central portion or even of nearly all of the epithelial nests is seen. These areas are the so-called epithelial pearls, which are of a yellowish color and disposed in layers resembling an onion. Epithelial pearls, however, are less numerous in the squamous-cell epithelioma of the cervix than in the same form of cancer in other tissues of the body. This difference is incident to the fact that one layer of epithelium in the cervix is not so well developed and often is entirely absent. Active nuclear division in the parasitic cells is especially prominent. One characteristic of these wandering cells is the increased amount of coloring-matter (chromatin) they contain. Cullen asserts that the pathologic diagnosis can be determined by the added color contents and the increased size of the cells. The cells vary in size, but are generally somewhat enlarged. The fibrous stroma enveloping the assemblage of cells (the cell-nests) is composed largely of fibrous tissue, yet contains a few muscular fibres and springs from the normal cervical tissue. This stroma, to a varying degree is invaded by round-cell infiltration, which is most marked in the margins of the growth and is due to the irritation of the invading neoplasm upon the circumjacent tissues. This inflammatory cell infiltration about the growth is apparently the effort of nature to construct barriers against the invading hostile cells. Round-cell infiltration is especially marked in cases where the development of the neoplasm is slow, while it is slight where the growth is rapid. In the latter, nature is overwhelmed by the rapid invasion and is unable to erect defensive barriers. In the stroma are situated the blood-vessels, lymphatics, and nerves. The stroma varies in amount according to the rapidity of the growth. In tumors of rapid growth it is more frequently indefinite, the tumor being largely cellular. Rapidly developing malignant tumors grow in two directions: 1, as an ingrowth and invasion of the cervical tissue proper; 2, as an outshoot or outgrowth of both stroma and cells, forming the cauliflower mass.

Later, in moderate disintegration, cancer appears under the microscope to invade the tissue more extensively, but the margin of the growth shows the histologic picture seen earlier. The older portion of the tumor exhibits the changes incident to necrosis and is covered with broken-down tissue, blood and detritus, welded together by fibrin. The tissue immediately subjacent discloses more or less degenerative change. As the disease progresses hyaline degeneration occurs in both the protoplasm and nuclei and occasionally giant cells will be found. As the cancer advances the necrosis and disintegration changes are more marked. The cell-nests disintegrate frequently and contain necrotic tissue and pus.

323. Adenocarcinoma of the Cervix. Cylindric-cell cancer, or adenocarcinoma of the cervix generally develops in the glands of the mucous membrane lining the cervical canal between the internal and the external os. The question has been disputed whether cervical cancer originates in the cover epithelium or in the gland. Some assert that it arises from the free surface epithelium; others that it has its origin from the epithelium of the gland. Winter declares that the disease most frequently develops from the combined point of origin of the glandular and surface epithelium, but now it is accepted generally that this form of malignant disease may originate in either of these structures. The disease is manifest in a number of forms—sometimes as a rounded nodule involving almost the entire cervix before disintegration results. It may appear in the lumen of the cervical canal in the form of tubercles, nodules, or papillary growths which fill up the cavity or are extruded from the os, while the external surface of the cervix is scarcely involved. Quite frequently the entire cervical canal is taken up with the cancerous process and yet pathologic changes are not manifest external to the os. The growth often appears as a hard, firm, waxy mass. Occasionally extensive inflammation of the diseased mucous membrane as well as of the muscle and cervical wall follows, causing thickening and hardening of the entire cervix. The carcinomatous nodule or nodules gradually undergo necrosis, leaving a sloughing, crater-like cavity in place of the cervical canal. The disease confined to the upper part of the cervical canal, may remain totally unsuspected, because it is hidden behind an uninvolved external os. As the disease progresses it gradually extends downward and makes its appearance at the external os, but more frequently has broken through the cervical wall into the parametrium. The growth may be far advanced before the vaginal portion of the cervix exhibits any indication of its existence. Palpation during this stage discloses the organ as hard, gritty, and nodular. Occasionally a fungus-like mass projects from the external os. A section through the cervix may disclose an advanced stage and a condition resembling a worm-eaten cavity. The disintegration of the carcinomatous tissue causes extensive excavation, which enlarges the external os in a fissure of considerable breadth. A large portion of the cervical canal may disintegrate thus. The history of its progress indicates that adenocarcinoma differs essentially from carcinoma of the portio vaginalis. Invasion in the latter is superficial. Ulceration follows early, but in the cylindric-cell cancer of the cervix the invasion penetrates rapidly the parametrial connective tissue, while the vaginal portion of the cervix is involved late, if at all. Extensive invasion and disintegration of the cervical canal occur without any break in the continuity or any appearance of the squamous epithelial covering the portio vaginalis. Considering the changes which the cervix undergoes as a result of extensive glandular inflammation, with penetration of the whole cervical wall by obstructed glands undergoing cystic degeneration, it is evident how rapidly the malignant growth would penetrate to the parametrial structures before manifesting its presence in the vagina. Cancer occasionally extends downward to the vaginal walls, but usually toward the body of the uterus and outward into the parametrial tissue. Occasionally it passes through the internal os and involves the mucous membrane of the uterine body. The entire uterine endometrium, or only a small portion of it may be invaded thus. Isolated cancer nests may occur in metastasis. The peritoneum may be penetrated, but the vesicocervical septum is more frequently invaded, affecting the bladder and enveloping the ureters with infiltration. The ureter is probably more frequently involved than the bladder, for in attempting complete removal of cancer I have often been compelled to excise portions of one or both ureters. The infiltration about the ureters obstructs the flow of urine and dilates the ureter and pelvis of the kidney, produces hydronephrosis, and when associated with infection, pyonephrosis. Infiltration and subsequent disintegration and ulceration of the structures of the bladder and ureters, or that of the rectum may cause fistulous communications through which the contents of the bladder and the rectum enter the vagina. While adenocarcinoma of the cervix does not invade the posterior wall and its investing peritoneum frequently, this occurs oftener than it does in cancer of the portio vaginalis. Extensive peritonitis is infrequent, as the invasion of the disease is preceded by inflammatory barriers. Occasionally, however, perforation may result and a suppurative peritonitis follow.

Histology of Adenocarcinoma. The term adenocarcinoma will imply that the structure is of a glandular character. The disease develops generally in the glandular epithelium, although sometimes it may originate in the cover epithelium. The epithelium lining the glands proliferates, thus projecting into and filling up the lumen of the gland as small processes. These projections unite with one another and in this manner one gland may be subdivided into fifteen or twenty smaller glands. The epithelial cells lining the glands are tall, columnar, narrow, and somewhat irregular in size. The cell nuclei are generally located at the base of the cell, but occasionally are found near the center. When a tendency of the cells to form new glands exists, the epithelial cells will be seen piled upon each other. It is often difficult, according to Waldeyer, to trace the connection of the carcinomatous growth with the orifice of the gland, yet he has secured sections demonstrating it. Ruge and Veit have shown that the glandular epithelium which ordinarily consists of but one layer becomes several layers thick, and that the original arrangement of the epithelium is lost. This feature of the disease is always evident, and the parasitic cells, when compared with cells lining the normal glands, will be seen to have special characteristics of their own. The first tendency to proliferation is intraglandular, the cells pile over each other, forming several layers in which intraglandular outshoots are projected, dividing the original gland into numerous compartments. Extraglandular proliferation occurs later. The basement membrane is fractured, followed by a wide proliferation and projection of the epithelial cells into the interglandular fibrous stroma. The interglandular proliferation may be so extensive as to fill the gland lumen completely. Cross-sections of such occluded glands under the microscope resemble epithelial nests found in squamous-cell carcinoma. The papillary projections from the external os are composed of papillæ covered with one or more layers of cylindric epithelium. The stroma structure supporting these processes is more fully developed than that of the squamous-cell carcinoma. Generally the epithelial cells of adenocarcinoma of the cervix differ morphologically and decidedly from those seen in the cervical epithelium. Active nuclear division is always well marked. The stroma has its origin in the cervical tissue and is usually infiltrated with small round cells. Inflammatory infiltration in adenocarcinoma is not so marked as when this process occurs in the squamous-cell epithelioma. The more rapid development of the latter may explain the lessened amount. As the tumor develops, interference with its nutrition follows and this leads to necrosis and sloughing. The older portion of the tumor, therefore, often is covered with disintegrated tissue, and immediately beneath it marked necrosis will be seen for a considerable depth.

324. **Adenocarcinoma in the body of the uterus** has its origin in the mucous membrane lining the interior of the uterine cavity, and arises either from the surface of the epithelium or from the epithelial lining of the tubular glands. This is the rarest form of epithelial malignant disease of the uterus, and is more likely to occur in women later in life or in those who have not borne children. As it more frequently occurs in women following the climacteric, it is the most hopeful of the different varieties of uterine carcinoma. The disease may originate at any point in the uterine cavity from the internal os to the fundus. It is unusual for the neoplasm to extend toward the internal os, and rarely does it reach the external. Therefore, in making a positive diagnosis it is necessary that the uterine cavity should be dilated to permit of its exploration with the finger, or the curet should be used and the scrapings examined microscopically. The disease may begin as a circumscribed nodule, springing from the surface of the mucous membrane, which consists of several delicate papilla-like processes. These processes may be irregular and wart-like in appearance, and the surface of the growth appears perfectly smooth. This is particularly true in the early stage of the development,

and the disease at this period may appear simply as a localized hypertrophy of the endometrium. The nodule gradually increases in size, and about its base, as the disease progresses, several smaller nodules will be found. Occasionally it may appear simply as a polypus with a very small pedicle. This growth may be so large as to fill up the entire uterine cavity. Such a growth may not be unlike the benign mucous polypus and consequently be confused with it. It is usually, however, more fragile and its surface less smooth. The proliferating mass is also much larger in comparison with the size of its pedicle. It is probable that these malignant polypi develop from the infiltration of distended uterine glands, or they may be produced by the malignant transformation of a benign mucous polypus. Epithelial malignant disease of the endometrium generally begins as a localized growth, although

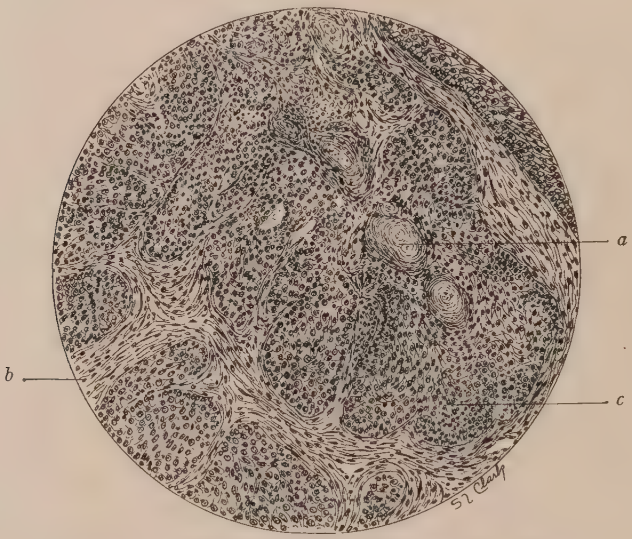


FIG. 523.—Squamous-cell Epithelioma of the Uterus.
a. Keratinization of cells forming epithelial pearls. *b*. Connective-tissue matrix. *c*. Collection of atypical cells.

occasionally the lesion, even in its earliest stages, simultaneously involves the entire mucous membrane. As it progresses, outshoots or finger-like projections are produced, which grow in the line of least resistance—that is, into the uterine cavity, gradually filling it. Such a uterus will be found enlarged, soft, and more or less boggy, A digital examination of its interior will reveal the cavity completely filled with a soft, friable, grayish-yellow, brain-like tissue. This tissue can be broken off and removed by the examining finger. Such a uterus compressed between the fingers within the vagina and the hand over the abdomen will often discharge disintegrating material. With the proliferation into the uterine cavity there is also a corresponding invasion of the uterine wall, although this is not so rapid. Section through the involved uterine wall or the basal portion of the tumor reveals a structure of more or less dense and firm consistence and of a yellowish-white color, which projects distinctly from the muscle. The growth gradually projects through the uterine wall and may present beneath the peritoneal surface. As it advances and ages, interference with its nutrition results and necrosis and disintegration of the older or superficial portions of the tumor follow. This necrotic material is gradually discharged and a scooped-out, crater-like cavity forms the uterine interior. The foul-smelling vaginal discharge is produced by the necrosis of the tissue.

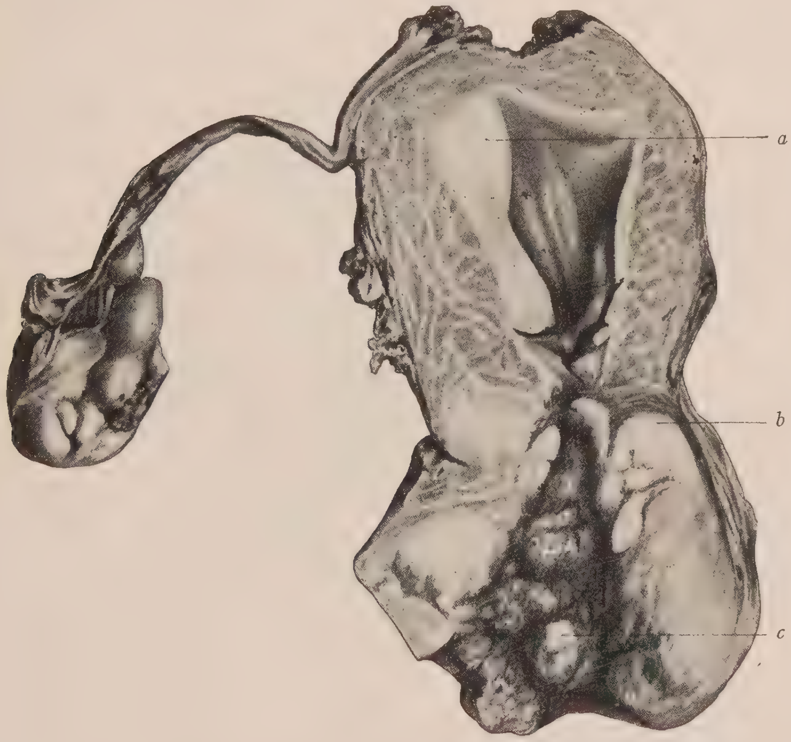


FIG. 524.—Adenocarcinoma of the Cervical Canal.
a. Cervical canal. *b*. Shows extension of disease to internal os. *c*. Hypertrophied endometrium.

Occasionally the cervical canal becomes completely occluded by the malignant growth, resulting in the accumulation of disintegrating necrotic tissue within the cavity of the uterus, forming a pyometra.

Histology of Adenocarcinoma of the Body of the Uterus. The microscopic picture presented by adenocarcinoma of the body of the uterus is not unform, but seems to differ in almost every specimen examined. Such differences occur in the epithelial cells covering the surface of the endometrium and in those lining the glands. In the early stages of the disease there occurs a piling up or stratification of the cells, which may be localized. These local proliferations gradually increase in size and project into the uterine cavity. In the interior of the nodules is found a well-marked supporting structure, composed of fibrous tissue containing muscle-fibres which convey the nutrient vessels. These nodular projections vary in size. Some are short and others are long-drawn-out bodies resembling the benign papilloma, but the cells covering the papillary projections are characteristic, and one of their strong features is the increased amount of coloring-matter they contain. The cells covering the processes are, as a rule, irregular in size, and rarely uniform. The cellular irregularities are marked throughout the tumor, some appearing short and others quite long. The epithelium covering the projections may be arranged in a single layer when the cells remain cylindrical. As a rule, more than one cell covering is noted, and the secondary layers are polymorphous in character. In other instances the picture presented under the microscope is more of the adenoid type, and the histology of the neoplasm is similar to adenocarcinoma of the cervix. Numerous glands are found of varying size, lined with columnar epithelial cells. These are irregular and contain oval, deeply staining nuclei. The cells lining the glands may be disposed in a single layer, but in many areas an intraglandular piling up or stratification of the cells will be seen, and in other areas fracture of the limiting membrane with an extraglandular proliferation of the cells is recognized. In these areas the cells will be found wandering in the fibrous stroma between the glands, and this perhaps is the distinctive stamp of the true malignant character of the tumor. Cullen believes

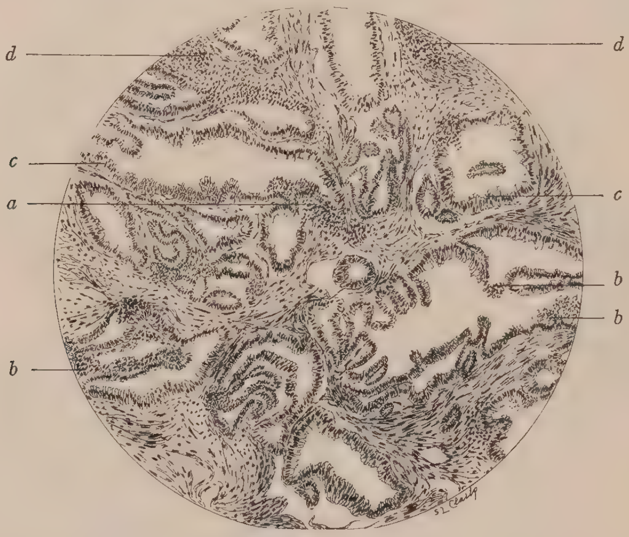


FIG. 525.—Adenocarcinoma of Body of the Uterus.

a. Cells fracturing basement membrane and infiltrating fibrous stroma. *b*, *b*, *b*. Intraglandular proliferation of cells. *c*, *c*. Irregularity of cells. *d*, *d*. Epithelial cells infiltrating stroma.

that in cases characterized by marked papillary arrangement the growth starts in the surface epithelium; whereas in the cases having distinct adenoid arrangement, the epithelium lining the glands has possibly been their origin. As the disease advances there is a disintegration of the peripheral portion of the growth; the surface undergoing destruction shows marked inflammatory infiltration, and the gland in the deeper portions of the tumor may show degenerative changes. As the necrotic process advances degeneration of the uterine muscle takes place and both muscle and glands are filled with inflammatory cells.

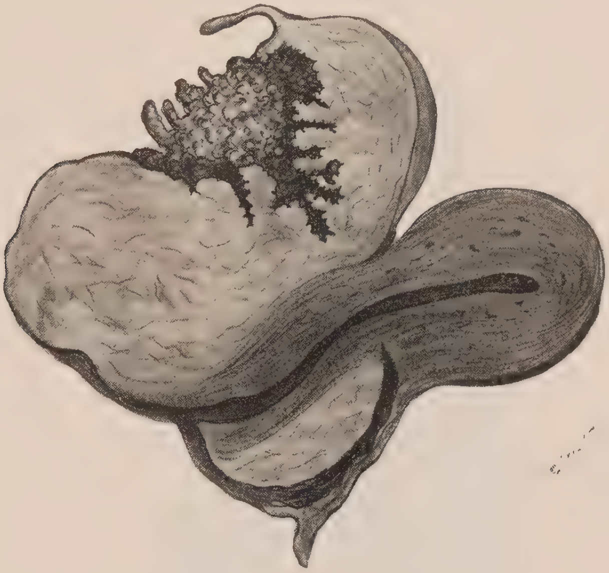


FIG. 526.—Cauliflower Growth Involving the Vaginal Part.

325. **Dissemination of Carcinoma.** Carcinoma is not confined in its development to the infiltration of the contiguous tissues already described, but manifests a disposition to spread through the lymphatics and blood-vessels to the structures more or less remote from that in which it originated, and here to form foci or nests of a similar character. Experience demonstrates that this spread of the disease through the blood-vessels is rare. Malignant ulceration of the blood-vessels, however, does take place, and metastases follow through the blood stroma. Seelig directed attention to the fact that the capillaries for a long time remained intact between the existing carcinomatous projections. He once saw a carcinoma ring around a vein which had infected the wall of the capillary up to the intima. Goldman has observed penetration of the thin walls of the vein by cancer with alteration of the lining endothelium. In this case circulation was obstructed with the formation of a thrombus. Abel recites the history of a patient, thirty-seven years of age, who had suffered two months with irregular bleeding and discharge. Examination failed

to reveal any indication of involvement of the vaginal wall or parametrium. Total extirpation of the uterus through the vagina was done, with as extensive removal of the broad ligament as possible. Subsequent microscopic investigation disclosed at some distance from the carcinoma, in a perfectly healthy looking area, a mass of carcinomatous tissue which infiltrated the wall of the vein. The occurrence of such conditions demonstrates the possibility of the transmission of carcinomatous masses through the blood stream. The principal method of extension, as already mentioned, however, is through the lymph-channels. The epithelial cones project into the connective tissue until they gradually reach large lymph-spaces. Having reached one of these spaces, they extend it rapidly. The more rapid development of the disease in pregnant women is caused undoubtedly by the increased size of the lymph-channels and the increased energy of the lymphatic circulation at this period. All observers recognize the rapidity with which malignant disease invades the tissues when it has developed in young women. This is undoubtedly due to the activity of the lymph circulation. Following the climacteric, and especially in senile women, the vessels become atrophied and small. The lymphatic circulation of the pelvis is very inactive. In such individuals, therefore, the disease spreads slowly, and it is only when the deeper structures have undergone infiltration that the lymph-spaces are opened and the disease is transmitted more rapidly. Seelig, in his careful in-

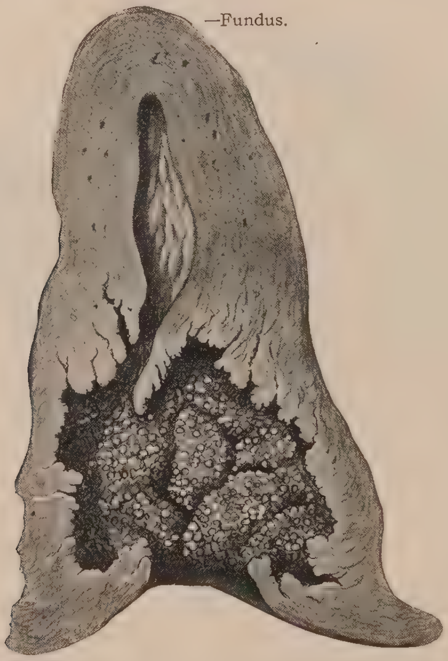


FIG. 527.—Cancerous Ulceration of Intracervical Canal.

vestigations on the progress of the disease, noticed the projection forward of carcinomatous masses into the endothelial lining of the lymph-spaces. These masses obstructed the large vessels more or less, although the vessels themselves could still be recognized in the structure. The largest lymph-spaces filled with carcinoma were situated in the margin between the middle and peripheral muscle layer of the corpus uteri, while the internal muscular branches anastomosed vertically. Investigation demonstrated that carcinomatous masses press against the connective-tissue or muscle-fibers until they are able to invade the lymph-spaces. Obstruction of the lymph-vessels frequently results in a regurgitation, by which portions of the malignant tissue are carried backward in the lymph-spaces in a direction opposite to that of the normal current. The invasion of the anterior wall of the vagina with cancerous disease, originating in the cavity of the uterus, may be explained thus. As the disease enters the lymph-spaces it is carried by the larger paths into the parametrium, where the lymphatics are frequently filled with carcinomatous masses. Emboli are carried from the lymph-spaces into the next lymphatic glands without the vessels themselves being involved. While it is generally recognized that the principal channel of invasion is through the lymph-vessels, yet it seems apparent that malignant disease of the uterus produces

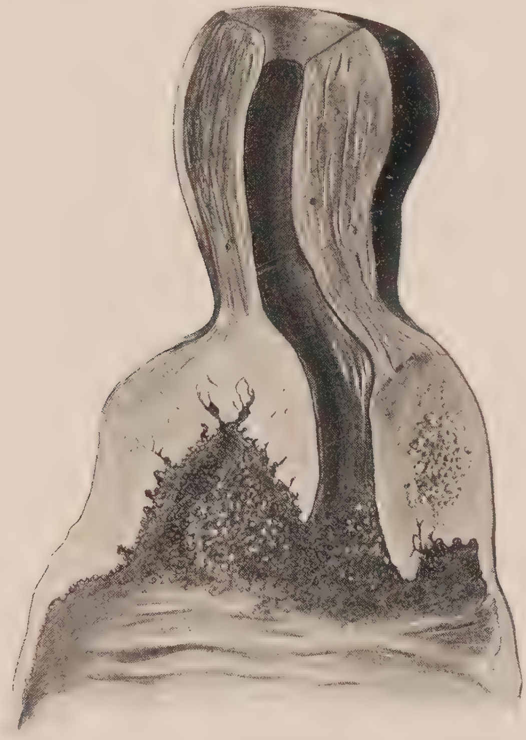


FIG. 528.—Cervical Wall Infiltrated while the Vaginal Portion is Largely Destroyed.

lymph-gland involvement at a later date than in cancer of other portions of the body. The later transmission of the disease to the lymph-glands is due undoubtedly to the more frequent occurrence of the disease at or subsequent to the climacteric, when the lymph-ducts of the pelvis have become atrophied as a result of the lessened activity of the genital organs. In women under forty years of age, however, this does not exist. It is in these patients that the disease makes the most rapid progress and the prognosis for cure is most unfavorable. Much difference of opinion exists among investigators in this field as to the frequency of glandular involvement, and necessarily the decision of this question has an important bearing upon the plan of treatment. Ries, Pryor, Wertheim, and others assert that as a result of careful investigation they have found a large proportion of the next lymph-glands infected very early in the progress of disease. Winter's results of microscopic examination of material and glands removed in extirpation of the uterus shows the percentages of glandular involvement to vary from 20 to 50 per cent. It can be asserted safely that one of every three women with uterine cancer has infection of the glands. The investigations as to the course of dissemination justify the assertion that it follows the main lymphatic vessels which are in line with the uterine arteries from the cervix and portio vaginalis. The first gland is found where the artery crosses the ureter and a series of them are imbedded in the parametrium. The three principal stations are:

1. The iliac glands at the inner border and on the anterior surface of the external iliac artery.
2. The hypogastric glands on the inner margin of the hypogastric artery and vein.
3. The sacral glands on the posterior pelvic wall.

Schauta agrees in the frequency of gland infection and in sixty carcinomatous bodies found cancer:

Twenty-eight in the iliac glands
Twenty in the sacral glands
Seventeen in the lumbar glands
Thirteen in the superficial inguinal glands
Eleven in the deep inguinal glands and
Nine in the cœliac glands.

Authorities disagree as to the early invasion of the glands. Recent careful microscopic investigations incline Wertheim, Ries, and others, to the belief that invasion is early in cervical carcinoma. On the contrary, Blau and Dybowski in ninety-three women dying from carcinoma found glandular involvement in only one-third. Winter in forty-four women dying after operation found the glands involved in two. Schauta has shown that the glands may remain free in advanced cases. In fifty inoperable cases the glands were involved in only eighteen or 36 per cent. Glandular enlargement does not always mean malignant infiltration, but is rather an indication of the accompanying septic processes associated with or complicating the carcinoma. As Schauta has shown, the infection may pass through the near glands to infect those more remote and inaccessible to operation. Those doubting early gland infection point to the number of cases where operation by either the abdomen or vagina has been followed by failure of the disease to recur for so long a period as to justify the assertion that a radical cure has occurred. When recurrence follows, in the majority of cases, it is found in or near the vaginal scar and not in the lymph-glands. Experience would seem to indicate that the involvement of the glands is not necessarily followed by recurrence of the disease. The removal of the original source in some cases is evidently followed by atrophy of the infected glands.

Cullen accounts for the failure to involve the lymphatic glands early in carcinoma uteri as in mammary carcinoma, by the fact that in uterine disease there is a greater disproportion between the size of the epithelial cells and the lymphatic vessels; that the epithelial cells rapidly attain a size too large to permit of their passage through the lymphatic vessels, and it is only after the disease has reached the large lymphatic spaces and vessels that lymphatic gland infection occurs. The experience of operators would seem to confirm the claim of the majority of investigators that lymphatic gland involvement occurs much later in uterine cancer than in other portions of the body.

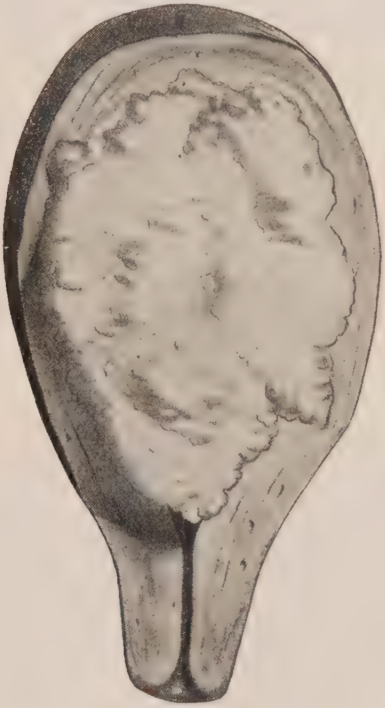


FIG. 529.—Circumscribed Cancer of Body of Uterus.

Clinical Forms. We have already seen that cancer is divided, histogenically, into two forms, the squamous-cell and the cylindric-cell cancer. Clinically it is divided into carcinoma of the portio vaginalis, of the cervix, and of the uterine body. It is divided clinically still further according to the course pursued and the physical signs presented. Thus, a collection of epithelial masses may break down upon the involved surface or in its center. The growth may project from the portio vaginalis

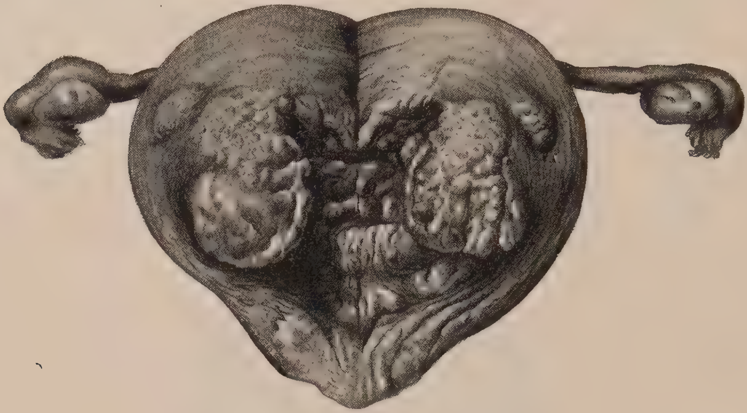


FIG. 530.—Diffuse Cancer of Uterine Body.

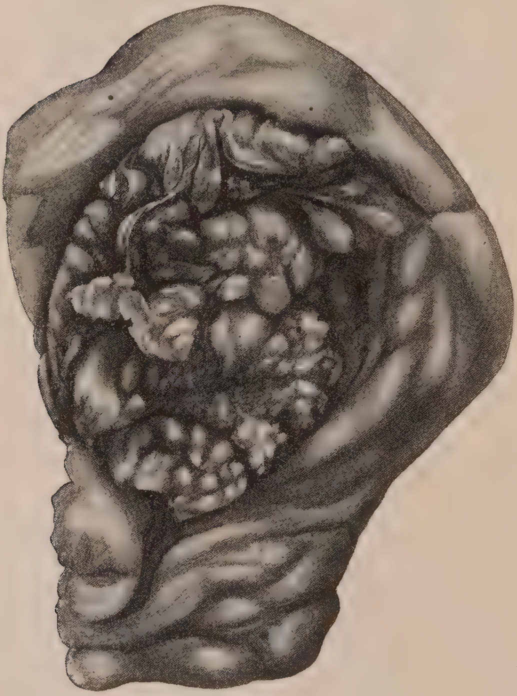


FIG. 531.—Adenocarcinoma of Uterine Body.

into the lumen of the vagina, or, at the same time, the connective tissue of the portio is occupied by the stroma and penetrated to its depth by cancer masses. These masses develop most frequently in cancer

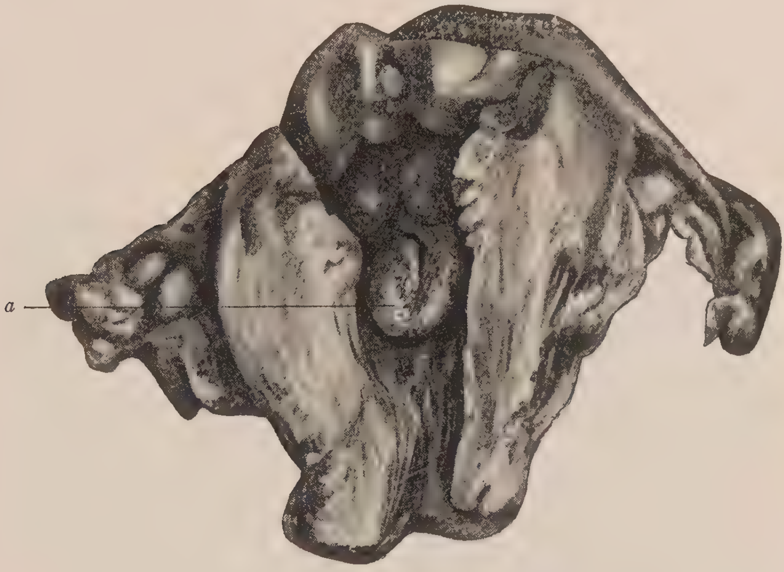


FIG. 532.—Incipient Adenocarcinoma of Uterine Mucous Membrane. *a*. Carcinomatous nodule.

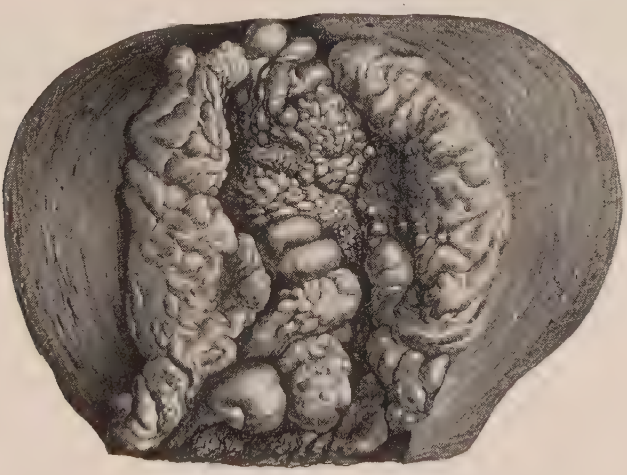


FIG. 533.—Entire Cavity Covered with Nodular Growths.

of the portio above the level and toward the lumen of the vagina, by which a superficially situated tumor known as a cauliflower growth is formed. It exists as a more or less roundish, polypoid tumor in the vagina, completely distending it, and presents a tumor the size of a fist, which becomes more contracted and firmer as the healthy structure is approached. The surface of the cauliflower, after desquamation of its pavement epithelium, reveals exposed carcinomatous masses and presents an irregular or papillary condition. When the disease has had a longer duration, with unfavorable nutrition of its interior surface and with compression of its vessels, large portions become necrotic and the cauliflower growth is covered with a grayish, greenish, smeary mass. Such growths most frequently start from the posterior lip. In many cases the disease develops in one commissure and extends from it to the lip; the entire portio vaginalis is rarely degenerated simultaneously.

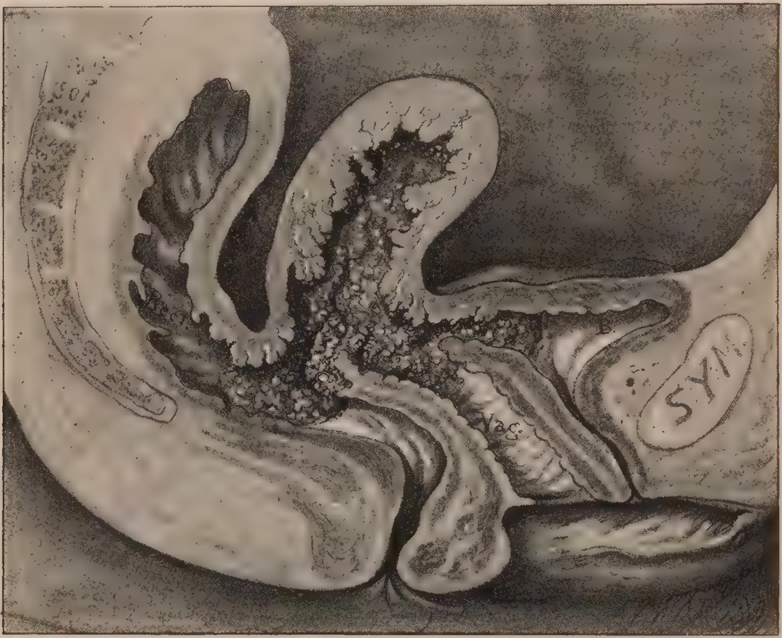


FIG. 534.—Communication between Bladder, Vagina, and Rectum.

In other cases processes of epithelial growth project into the substance of the portio, and in deep infiltration there is thickening of one lip of the commissure. In rare cases the entire portio vaginalis becomes involved and the more affected lip grows toward the lumen of the vagina. This form differs from the cauliflower growth by being polypoid and by having a mucous membrane drawn over it, which is rarely quite intact. Frequently the mucous membrane is thrown off in superficial layers and is followed by disintegration of the surface of the infiltration; or it begins in the center and opens through the infiltration to the outside. A smooth funnel or fissure will thus be formed, with jagged, often undermined borders, sharply lying toward the circumference and appearing under the level of the healthy surroundings. In such a fissure an ulcer will occasionally dissect deeply into the portio. Movable polypoid tumors will project into the ulcer or around the cervical canal, without special alteration of the canal itself. (Fig. 535.) Smooth ulcers are occasionally observed, similar to the erosion, which extends to a trifling depth. Why these variations in the progress of the disease exist is as yet undetermined.

Etiology. Our knowledge of the causes of malignant disease is still largely speculation. Among some of the more important theories as to its development is : Virchow's, that while cancer is of epithelial origin, it is only through metaplasia or mesodermal elements that it originates; in other words, a transformation of the connective-tissue cells. Cohnheim advocates the theory that it was transmitted from embryonic carcinoma germs. Ribberts believed the epithelial cells separated from their connection without anaplasia; Thiersch and Waldeyer, that by primary growth of the epithelium, without alterations of biologic properties of the epithelial cells. All agree that there is no distinctive cancer-cell.

In recent years increased attention has been concentrated upon the determination of some micro-organism which shall prove to be a causative factor. The parasitic theory seemed favored by the natural history of the disease, its local origin, its invasion of the surrounding structure, and its transmission by the blood- and lymph-vessels. The mere fact that a specific micro-organism has never been isolated and recognized is not a convincing objection, for syphilis, until recently, has baffled all attempts to recognize its essential organism, yet no one doubted that it was so transmitted. Klebs and others have presented various micro-organisms, but none of them have survived careful investigation. The presence of cancer results in the development of micro-organisms of various kinds, just as is found in other inflammatory processes, but none of them will reproduce the disease. Various degenerative processes in the cells have been indicated as possessing the parasitic elements, only to be proved untenable. Schwarz has demonstrated most convincingly that the majority of cell alterations favoring the parasitic theory have so far resulted from degenerative processes of the epithelial cells, leukocytes, or their derivatives. A fundamental pathologic difference exists as in the malignant form a further extension of the processes in the organism is influenced by the cell activity, and there is as yet absolutely wanting any proof of isolation of a parasite from which the disease can be generated. The absence of any history of the transmission from man to animal or from one animal to another has been cited.

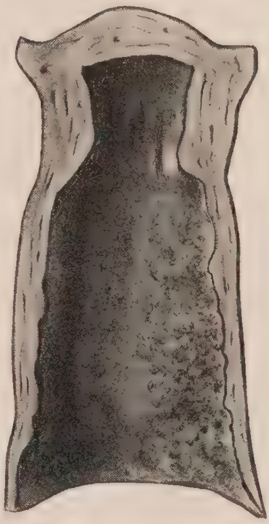


FIG. 535.—Cervical Canal Destroyed by Progress of Disease.

The occurrence of carcinoma in the penis of the male who has cohabited with a cancerous female is so rare as to be the exception to the rule, yet these negative arguments are only additional evidence that we do not know the micro-organism or its natural history. Surgeons frequently injure themselves while operating, but no authentic case exists by which the development of cancer may thus be traced. Experimental observations, however, have demonstrated the fact that carcinomatous tissue when transferred from one animal to another of the same species will continue to grow, while carcinomatous cells developing in the human individual when implanted in the tissue of another person may refuse to grow; the tumor-cells when placed in a raw surface distant from the original site of the growth may develop a secondary tumor. I have operated upon patients for carcinoma of the cervix who have subsequently developed secondary malignant disease of the abdominal incision. In one of them the disease developed nine months after the operation; in another after a period of over three years. In the latter patient the abdominal scar was involved in a hard, indurated mass, which upon incision revealed the intestine adherent and its walls infiltrated with carcinomatous tissue. The abdominal scar was excised with the affected intestine, and the patient made a complete recovery. There was no evidence of recurrence of the disease in the pelvis at the time of operation.

It is more than probable that cancer owes its origin to the action upon irritated cells of some peculiar toxin or chemical material which is formed within the body. This theory seems to be confirmed by the interesting investigations of the processes of cell reproduction recently published by Ross. He was able to produce mitosis and cell proliferation by stimulating the living leukocytes and lymphatics with alkaloids; and the results were particularly active under the influence of choline, cadaverine, kreatin, and xanthine, extractives obtained from animal tissues. This theory seems further confirmed by the repeated successful vaccinations with cancerous tissue and the knowledge that cancerous tissue which has been ground with mortar and pestle until all the cells are broken may be injected beneath the skin with impunity.

Evidently, increasing age predisposes the cell to carcinomatous degeneration. Statistics indicate that cancer of the uterus before the twentieth year is extremely uncommon and that it is but rarely observed during the next ten years. The disease perhaps makes its appearance most often immediately preceding or about the period of the menopause. Carcinoma of the body, however, usually appears later. Gusserow, in 3385 cases, found but 2 originating before the twentieth year. It develops with increased frequency during the fourth decennium, but the majority of cases are recognized in the fifth. Thiersch believed the greater frequency of cancer with advancing age was due to atrophy of the connective tissue, which favored the deeper infiltration of the epithelial tissue, but this is a mere hypothesis. It is a question whether the apparent increased frequency of cancer is not due to the fact that under improved methods of investigation it is more apt to be recognized. Reyburn and Lewers attribute its frequency to diet, and direct attention to the infrequency of this disease among rice-eating populations. They assert that the disease is largely due to the consumption of large quantities of meat.

Inherited predisposition to the development of cancer has been regarded as an important factor, but careful researches by Gusserow showed but 7.4 per cent. favoring such a tendency, while von Winckel found but 6.3 per cent. Inherited lowered resistance to disease, as shown in families predisposed to tuberculosis and chronic renal disease, favors the development of malignancy.

Twice as many women suffer from cancer as men. Next to the mammary gland, the disease occurs more frequently in the uterus. According to Hofmeier, fully one-fourth of all cancers in women are uterine.

All classes of society are prone to the occurrence of cancer. It may occur with equal frequency in the poor or the rich. The apparently well-nourished woman may be unsuspectingly harboring the preliminary stage of the disease.

All statistics prove that malignant disease preponderates in those who lead an active sexual life, especially in the multiparous woman. Gusserow's investigation of a large number of cases gave the average of fruitful labors in cancerous women as 5.1 per cent.—a proportion of births considerably above the average for women taken together. Accepting the irritation theory of Virchow as a factor, we can readily appreciate the greater frequency of cancer of the cervix. The possibility of cancer of the cervix in the chaste virgin has been doubted, but I have seen several single women of unquestionable virtue who suffered from cancer of the cervix. Cancer of the body of the uterus is comparatively more frequent in the unmarried and nulliparous women. The theory that cancer can be produced by excessive coition is not borne out in the lives of prostitutes. Carcinoma is rarely secondary in the uterus, having originated in the bladder or vagina. Myoma of the uterus is sometimes associated with cancer, but not often enough to justify the assertion that it is a determining cause.

Landau is inclined to assign syphilis as a predisposing cause, but my observation does not incline me to accept it. Von Winckel's assertion that gonorrhea is an important factor in the development of cancer needs confirmation. With all our investigations we are driven back to irritation, chemical or mechanical, as a cause for malignant disease, but its existence does not always determine such a degeneration. We are forced to acknowledge that we do not know why cancer develops.

Symptoms. Unfortunately, in the early stages no symptoms, either subjective or objective, are sufficiently prominent to give warning of the impending danger. As a consequence, the physician rarely has an opportunity for early investigation of the disease. Cancer has no pathognomonic signs; the principal symptoms—hemorrhage, more or less offensive discharge, and pain—are not constant in all cases, and each one or all may be produced by other than malignant conditions. Bleeding is the symptom of greatest significance, and may occur when the cervical canal is affected, though its vaginal portion is uninvolved. The quantity of blood lost probably will be slight and irregular, as a few drops after severe exertion, straining at stool, or following coition. In the married, post-coitive hemorrhage is a most constant and suggestive symptom. Generally the first suspicion will be awakened by an increase of the amount of blood lost at menstruation, or the flow will be continued unduly long, but neither of these is constant. In other cases the first intimation will be profuse bleeding. Following the climacteric, an occasional more or less profuse bleeding will occur, which causes the patient to think that her menses have returned. Post-climacteric pudendal bleeding should always be regarded as a serious danger-signal demanding careful and painstaking examination. As cancer advances, hemorrhage becomes more active, the blood is discharged in a continuous bright stream, or more frequently in large clots, which are formed in the vagina. Frequently the hemorrhage is accompanied by a discharge of fragments of disintegrating tissue. The continuation of hemorrhage produces marked anemia and promotes the cachexia, but is rarely the direct cause of death. Unfortunately, women generally regard increased and irregular bleeding as a necessary concomitant to the climacteric, a view which is maintained too frequently by the attending physician. On the contrary, any excess and irregularity in the flow should always be regarded as an indication of grave danger, demanding most thorough investigation of the genital tract, supplemented by microscopic investigation, if necessary, to ascertain the specific cause. Nothing should be taken for granted or left to chance. No palliative measures nor remedies to arrest bleeding should be employed prior to an examination. If the physician is unable to satisfy himself as to the cause, duty to his patient demands that she shall have the benefit of further consultation.

Offensive discharge is next to hemorrhage in the time and frequency of its appearance. In an early stage the discharge is slimy and serous and does not have an especially penetrating nor offensive odor. As the disease advances and is associated with ulceration and disintegration of tissue, the secretion changes. It becomes yellowish; then, with a mixture of blood and disintegrating tissue, reddish and brownish; and, finally, a dark smeary mass. At first it has a stale, sweetish odor, becomes more disagreeable, and finally presents an intensely penetrating, stinking smell, alike disgusting to the patient and to her attendants. When patients have suffered from cervical discharge possibly for years, little attention is given to the increase of the amount until the odor becomes so marked and disagreeable as to demand consideration, when frequently it will be found that the time for successful treatment probably has passed. Decomposition of the secretion is undoubtedly due to saprophytic or putrescent germs, and the greater accessibility of the cervix causes the odor of its secretion to become affected earlier than that of the uterine cavity.

Pain is a comparatively late symptom. The cervix, as is well known, is not a specially sensitive structure, and the severe pain occurs with the involvement of the parametrium, and is later increased by pressure upon nerve-trunks. In uterine cancer, or when the cervical canal is involved, pain is more marked, and is an earlier symptom, owing to encroachment upon the internal os and obstruction to the canal. The absence of pain leads many patients to regard the increased bleeding and discharge with less suspicion. When an effort is made to impress a woman so afflicted with the gravity of the situation, she will doubtingly exclaim: "Why, I have no pain!" Slightly extended nodules near the cervix, by pressure upon the nervous plexuses in the retroperitoneal connective tissue, may produce a lively, persistent, boring pain in the depth of the pelvis, which is increased to an extraordinary degree by the slightest extension. It causes persistent lancinating pain, which is not alleviated by continuous rest in bed, and only the persistent use of narcotics affords any mitigation. As the disease approaches the peritoneal surface the pain is increased, serious reaction in the nutrition is induced, from which inflammatory adhesions with the surrounding structures result, and thus an extensive peritonitis is caused. The abdomen is sensitive to pressure, and, according to Schröder, vaginal examination reveals the uterus surrounded by board-like hardness. Not infrequently the symptoms may be aggravated by compression and narrowing of the rectum through advancing infiltration of the pelvic connective tissue.

The mechanical obstruction to the passage of fecal masses is generally associated with severe, agonizing pain; obstinate constipation arises, partly from the mechanical hindrance, but more from the desire to avoid the severe pain at stool. In cancer of the neck of the uterus, when the disease is transmitted to the bladder-wall, even before the entire wall is penetrated there is a burning sensation during the evacuation of urine, soon followed by tenesmus, frequent micturition, bloody, clouded, or purulent urine, with persistent vesical pain. With infiltration and necrosis of the structure a direct communication follows. The admixture of ammoniacal urine with the offensive vaginal discharge aggravates the already lamentable condition of the patient by a horrible stench. The profuse, irritating vaginal discharge produces an extensive erythema of the vulva and inner sides of the thighs, and causes the patient to complain of intense itching, or pruritus vulvæ.

The offensive character of the pudendal discharge may be still more aggravated when the disease involves the peritoneal surfaces of Douglas' pouch and is transmitted to the rectum and upper part of the rectovaginal septum, which breaks down and forms a rectovaginal opening. Occasionally, a large cloaca is formed, into which urine and feces, mixed with decaying tissue, are discharged, forming a most deplorable condition. Fortunately, the rectum is less frequently involved than the bladder. Frommel asserts that vesical fistula appears in one-third of all cases, rectal fistula in one-sixth. In the progress of the cancerous infiltration on either side or in front of the cervix the ureters will become involved sooner or later. The infiltration extends about and compresses their lumina, attacks the structures of the wall, and finally may occlude it completely. So long as the passage of urine remains free, the patient experiences no ill effect, but the compression causes a gradual dilatation of the ureter and pelvis of the kidney; a condition of hydronephrosis follows, and indications of uremia. If but one side is affected, the other kidney does compensatory work, and, beyond a possible sense of fullness and weight in the affected organ, there is but little discomfort. When both organs are compressed, uremic symptoms follow, though never violent, rarely convulsive, and gradual coma is developed, which causes increased indifference to surroundings, and fortunately, to the profuse pain. Disgust for food is marked. Vomiting occurs frequently, and suppression of urine may be present.

Reduction in pressure from degenerative changes in the infiltration will often restore the caliber of the canal and permit the urine to pass. The sensorium will become free and so continue until new compression symptoms appear. An autopsy frequently discloses above the cancer infiltration dilated ureters, sacculated kidneys, occasionally pyelonephrosis and amyloid degeneration of the kidney. Continuation of the infiltration processes causes obstruction of the veins and arteries of the pelvis with edema of the vulva and of the lower extremities. Hemorrhoidal veins become greatly distended and cause profuse bleeding. The resistance of the peritoneum to the encroachment of the disease is marked. Its approach to the peritoneum is followed by reactive inflammation and extensive adhesions, so that cancerous nodules rarely reach the peritoneal cavity. Sepsis is also rare. When septic peritonitis is produced, it is caused by rupture, by pyosalpinx, or by penetration of the cavity from the cancerous nest. While sapremic symptoms are frequently associated with cancer, the temperature elevation is not high, for the reason that the disintegrating tissue is usually shut off from the general system by a zone of hard infiltration tissue, which is not very absorptive. When high temperature is present, it generally is due to an extension of the disease to other organs, especially the bladder. It is important to ascertain the presence of metastasis to other organs. In the ordinary course of the disease it extends to the vagina, bladder, rectum, and vulva; but it may reach the same glands by metastasis, as well as the ovary and retroperitoneal glands. Metastasis may occur into remote organs, as the liver, lungs, and kidney, although the number of cases in which wide diffusion occurs is comparatively few.

Cancer affects the mature, debilitated, and overworked, but is also found in the well nourished, and not infrequently in the comparatively young. (Fig. 536.) The disease in the latter is usually more rapid in its course. Its mere existence is an evidence of lessened resistance to its ravages. In the early stages, with patients in good condition, the general appearance would contra-indicate its existence; but with recurring hemorrhage and discharge, emaciation rapidly occurs. Emaciation is more rapid when to the other symptoms is added pain, which robs the patient of her night's rest. To the drain from hemorrhage and to the loss of rest is soon added the depressing effect of the putrid changes, from a collection of organisms which exert a painful influence upon the general condition. The skin is pale, and gradually becomes a smutty yellow from increased emaciation. The eyes are sunken and the skin is thrown into loose folds or appears to be drawn over the skeleton. A patient exhibiting such changes is said to be cachectic. The indications of suffering are stamped upon the countenance so indelibly as to be recognized readily by the experienced observer. From other conditions causing uterine hemorrhage, as myoma especially, a cancerous patient is recognized by the tanned appearance of the skin and the progressive emaciation. In myoma she may become pale, anemic, and often yellow, but there is no loss of flesh. Indeed, the embonpoint seems increased. In cancer the loss of strength is aggravated through the increased disgust for food occasioned by the foul-smelling atmosphere in which she is forced to live. Gusserow's view is undoubtedly correct, that the intense odor occasions the nausea. This is made manifest by the return of appetite, when by any medical or surgical procedure this symptom is temporarily removed. Vomiting is generally a late symptom, and most frequently the result of uremia. Rarely, it may be occasioned by invasion of the peritoneum. The loss of strength and flesh is progressive, until finally the patient dies in profound marasmus. Occasionally, she suffers no convulsive attacks from uremia, but just sufficient coma to render her insensible to the discomfort of the condition. In some cases septic or carcinomatous peritonitis, pleurisy, pneumonia, lung embolism, or amyloid degeneration of the large glands leads to a premature end.

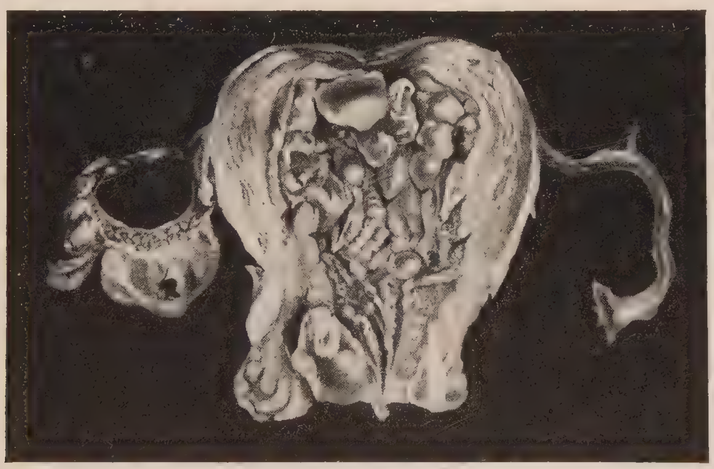


FIG. 536.—Uterus Removed from an Unmarried Woman Twenty-two years of Age.

Physical Signs. In the previous discussion it has been asserted that carcinoma has no pathognomonic symptoms, consequently its early recognition will depend largely upon the correct interpretation of the physical signs. Unfortunately, the patient may have no symptoms affording such discomfort that she will feel it necessary to consult a physician, and, as a natural consequence, the disease often will be in an advanced stage before the patient comes under observation. Many patients do consult a physician, however, and are subjected to local treatment for other conditions than the grave one which should attract his attention, and thus valuable time is lost. It is to save such cases that, at the risk of reiteration, this section is written. The disease in many cases is hidden within the uterus and the physicial signs consequently are obscured. Fortunately, in the great majority of patients the disease affects the cervix and cervical canal. The sqaumous-cell cancer affects the external portion of the cervix and appears as a small tubercle or projection upon one or the other lip of the cervix. In the majority a more or less extensive laceration of the cervix will be present. This tubercle will give the sensation to the examining finger of a shot-like mass, but manipulation of it is associated with slight bleeding. Often the papule will be friable and can be broken off. As the disease advances the surface presents a superficial ulceration, which is above the level of the surrounding healthy structure. Its edges are prominent, infiltrated, ragged, often overhanging; its surface more or less excavated, covered with friable tissue, portions of which are easily broken off, and it has an infiltrated base. Pressure against such a surface with a sound permits the point of the instrument to become buried in friable tissue. The most careful examination is attended with bleeding. Frequently the vagina will be found occupied by a mass which may vary from the size of a filbert to that of a good-sized fist. Such a tumor presents an irregular, pinkish-gray surface, often covered with a greenish-yellow exudate. The mass may be continuous with one lip or the entire cervix may be involved. The surface has a granular, friable feel, will readily give way under the pressure of the finger or of an instrument, and is associated with a very offensive discharge. Adenocarcinoma within the cervical canal may make extensive progress before it becomes visible. Even when invisible, the external portion of the cervix appears paler, and to the examining finger, gives a sensation of hardness or resistance, firmer and less elastic than when due to inflammatory exudation. The cervix often will feel hard and dense when carefully palpated, and the pressure usually causes a discharge of blood from the os. Frequently the existence of a laceration permitting access of the finger, will reveal the presence of hard nodules, fragments of which are broken away easily. Or, the surfaces may present a large mass of infiltration, the center of which has become necrosed, affording an excavation with infiltrated, overhanging edges and a pultaceous, friable surface. In more advanced cases the cervix may be a mere shell, a large part of the uterus being involved. The infiltration can be recognized involving the walls of the vagina, the lumen of which is contracted by the disease. Carcinoma of the uterine body may be inaccessible to touch until well advanced, unless its uterine canal is subject to dilatation. Intra-uterine indagation reveals an outgrowth from a portion or the whole of the uterine cavity, which, soft, and friable to the finger, rests upon a firm and indurated base. When the wall of the uterus is extensively infiltrated, the increased resistance can be recognized by recto-abdominal palpation. The penetration of the uterine wall by infiltrate is recognized in the nodules beneath the peritoneum, which roughen the otherwise smooth surface of the uterus. No discussion of the physical signs of carcinoma is complete without a consideration of the revelations of the microscope, but as they have been studied under the various forms of disease, and under diagnosis, I will not discuss them here.

Complications. The more frequent complications of uterine cancer are myoma, ovarian tumor, peri-uterine inflammation, and pregnancy. The moyma usually does, and the ovarian tumor may, precede the development of the carcinoma. Attention has been recently directed to the association of myoma and carcinoma in the same patient (see Fig. 500), with some effort to indicate a causative relation; but with the frequent occurrence of uterine myoma, it should not be surprising to find the coëxistence of carcinoma even more frequently than is recognized now. Cancer begins in the uterine mucous membrane and subsequently may extend and infiltrate the growth, which can be affected primarily only when it includes some glandular structure. It has occurred to me that the irritation induced by the prolonged use of electricity in the treatment of a fibroid growth may favor the development of malignant disease. I have seen carcinoma occur in two cases subsequent to the use of electricity, but the cases are too few to justify any conclusion.

Ovarian tumor may be benign or malignant. Benign growths may become involved secondarily. The cancerous tumor of the ovary, however, varies greatly in its influence and in its manner of progress from the benign.

Peri-uterine inflammation may precede or follow malignant disease. In the latter instance it is simply a reactive inflammation by which nature endeavors to bar the progress of the malignant disorder. It is important, in investigating the case, however, to differentiate between the peri-uterine exudation and the cancerous infiltration, as such a diagnosis would influence the operator in his treatment of the cancerous uterus.

Pregnancy is a frequent complication of malignant disease. Carcinoma in its earliest stages does not contra-indicate the occurrence of pregnancy. The association of uterine cancer with pregnancy and labor presents the gravest danger for two human beings. The frequency of the complication may be determined by the consideration of the following statistics: Von Winckel, in 20,000 labors, reported 10, and Stratz 7 in less than 18,000; in the Tübingen clinic, in fifteen years, out of 5001 labors there were 7 complicated with carcinoma. One cause of the rare association of pregnancy and carcinoma is the fact that the latter exists in the majority of cases in the later years of life after the period of fertility is passed more or less. The situation of the disease will have something to do with the possibility of pregnancy. In 89 cases of associated pregnancy and carcinoma the malignant disease was found 38 times in the cervical canal and 47 times in the portio vaginalis. In 4 cases the site was not determined.

When complicated by pregnancy, the disease presents no symptoms essentially different from those in the uncomplicated cases, but, with the necessarily increased congestion of the pelvic organs, makes more rapid progress, so the characteristic symptoms—hemorrhage, discharge, and pain—rapidly become aggravated. Hemorrhage is increased, is more or less copious, and is associated with an offensive odor. A profuse, watery, exceedingly offensive discharge, at times purulent and brownish, is constant. The discharge is more abundant and putrid the more marked the tissue destruction in the new formation.

It is of interest to study the effect of carcinoma on pregnancy and labor. The disturbances which such complications may induce in the course of pregnancy and labor must necessarily depend upon the situation and extension of carcinomatous disease; sometimes they are only trifling, but occasionally they mean the death of mother and child. Progressive and severe hemorrhage, profuse leukorrheal discharge, associated with a complication of pregnancy, result in general anemia, which produces a gradual loss of strength. The existence of the trouble renders the development of cancer more rapid, and consequently early interference should be considered as indicated. The influence upon labor, when pregnancy goes to full term, depends entirely upon the situation of the disease. The accompanying endometritic processes can lead to placenta prævia. When the disease is confined to the vaginal portion of the cervix, it will not be impossible for labor to be spontaneous, but obstructions occur as soon as the portio is circularly seized in its entire circumference; or, if the cervical canal has become strongly infiltrated, the tissue is absolutely unyielding. Unless prompt measures are resorted to, such a patient may suffer from hemorrhage, exhaustion, and fatal termination, with the fetus still *intra partum*.

Among the complications with labor are premature rupture of the amniotic bladder and weak labor-pains. If the pains remain active, the embryo is forced through, but the process results in extensive tearing of the cervix, which may extend to the pericervical connective tissue, cause the most extensive bruising and crushing of the birth canal, even tearing the cervix away above the infiltrated ring. Equally significant is the influence of pregnancy and labor upon the cancer. It was once considered that the existence of pregnancy had a beneficial influence on the progress of the cancer growth. Von Siebold is reported to have observed the spontaneous recovery of genital cancer from a simultaneous pregnancy. The experience of recent years combats this idea. The rapidity of the growth depends upon the character of the disease, being much more rapid in the soft and medullary form than in the scirrhous variety. The labor can cause the most extensive destruction of the parts, and moreover, may be followed by infection of the tissue, leading to thrombosis, sepsis, and pyemia.

Diagnosis. Hope for radical relief from cancer in the majority of cases will be dependent upon its early recognition. The investigations of Virchow dismissed the idea of cancer being in origin a constitutional disease and demonstrated its purely local character. A study of its clinical course, however, indicates that while the disease is local in character at its origin, transmission to the surrounding structures takes place sooner or later when the disease practically becomes constitutional. It is important, therefore, that the practitioner should recognize the gravity of the disease at the earliest possible moment. When the condition is one of doubt, the attending physician, in the interest of his patient, should have the doubt resolved by securing the advice of a more experienced man. Only by early recognition and by radical treatment before the development of nests in the parametrial tissue or its transmission to the more remote lymphatic glands, can we hope to avoid the fatal termination of this disease. It is well known that many patients do not appreciate the gravity of their symptoms and do not consult a physician until the favorable period for intervention has passed. It is unfortunately true that perhaps a greater number are given general or local treatment or are advised to wait the change of life, by which time the disease has become incurable. This delay is frequently due to the aversion of the patient to a gynecologic examination, but the physician will be wise to decline absolutely to accept the responsibility of treating a patient who will not allow him to use the proper means of determining her condition. Should he treat her without the necessary investigation, the patient and her friends will hold him responsible for any untoward developments.

The ease with which the diagnosis can be determined must depend on the situation of the disease. Following the classification given of cancer as involving the portio vaginalis, the cervical canal, and the body of the uterus, one is prepared to find physical signs varying with its situation. The association of hemorrhage, foul discharge, and pain should awaken a profound suspicion that only careful examination will negative. Carcinoma of the portio vaginalis, as a rule, is easy to recognize. It is accessible to the investigating finger, and is exposed readily to vision by the speculum. The most characteristic form is the cauliflower growth, which springs by a narrow base from one lip or the other, and may fill the vagina. It presents to the finger an irregular, nodular mass, which bleeds upon the slightest touch, is very friable, and frequently covered by a greenish exudate or slough. The mass may vary from a nodule the size of a bean to a growth the size of a fist. Instead of an exuberant growth, carcinoma may present an excavated cavity with indurated wall and base and undermined edges. In involvement of the cervical canal the external os may present a crater-like opening or may appear healthy. Early in the cervical form no external indication of its presence may be apparent. The infiltration is confined to the mucous membrane of the canal.

Following the rule to demand a proper examination, an exploration of the uterine cavity will be required. This will be secured most effectively by the use of laminaria tents, which have been prepared by soaking in a saturated solution of iodoform and ether, or better, in tincture of iodin, prior to insertion. Tissue occupied by carcinomatous infiltrate will not dilate readily. The scrapings obtained by the curet often show irregular fragments which are broken or crumbled easily, in place of the long thickened pieces removed in endometritis. The curet, or better still, the finger, will disclose a roughened, indurated canal which is characteristic. Early in cervical cancer small indurated nodules appear, which later are friable. Cancer of the vaginal portion fails to involve the cervical cavity early, which justifies the assumption that the cervix is free except in advanced cases. In suspected cancer the affected tissue, either in the form of scrapings or an excised piece should be examined microscopically. The excised section should include both healthy and diseased tissue, so that the transition from one to the other may be studied better. The objection has been made that the microscopical examination takes valuable time in the preparation of the specimens, but Smyly suggests the following two methods for rapid examination: First, a small piece of firm tissue is selected, dipped in mucilage, and placed in a freezing microtome. Partly frozen sections are cut, transferred to Müller's fluid or to a 2 per cent. solution of potassii dichromas, and, after a few minutes to an hour, stained and mounted. In the second method a piece of the tissue the size of a bean is placed in twenty times the quantity of methylated spirit or, preferably, in alcohol for a few hours, then a few hours in running water, and dipped in mucilage. Sections are made after freezing. The sections are removed from water to the slide, where they are stained with either picrocarmin or rubin and orange. These methods are too complicated for the general practitioner.

Spiegelberg has emphasized the closer adhesion of the mucous membrane to the underlying tissue in cancer over that which exists in inflammation. Naturally, the diagnosis must comprise the recognition of cancer, the extent of involvement, and the possibility of radical treatment. Digital rectal examination gives information as to the infiltration of the parametrial tissue. Nests or nodules may be recognized on the posterior surface of the broad ligament, which, with the extension of the infiltration lead to firm fixation. This fixation should be distinguished from inflammatory trouble or cancerous infiltration. In the latter the involved surface is more irregular, presents small, hard nodules, and a more distinct limitation, which can be determined through the rectal examination which should be a matter of routine. It can be accomplished more effectively if the patient is under an anesthetic. Twice I have found coëxisting rectal cancer in women who otherwise would have been favorable cases for uterine extirpation. In neither of these patients did there seem to be any connection between the cancerous growth of the rectum and that of the uterus.

The conditions which may be mistaken for cancer are:

Chronic cervical catarrh with laceration.
Papillary erosion of the cervix.
Necrosis of fibroid polypus.
Syphilitic ulceration.
Partial retention of the products of conception.
Chorio-epithelioma.
Sarcoma.

In chronic cervical catarrh with laceration nature makes an effort to repair the injury. The increased weight of the organ and its situation lead to eversion of the lips, and the fissures are occupied by hard, resistant tissue. The exposure of the tender cervical mucous membrane causes inflammatory changes, thickening and eversion, obstruction of the ducts of the glands of Naboth, and the formation of Nabothian cysts. The surface frequently is covered with granular tissue, which bleeds readily upon the slightest touch; the patient consequently has increased bleeding during menstruation, more or less bleeding upon exercise, or following coition. The indurated surface with a tendency to bleed, the increased leukorrheal discharge, the nodular condition produced by the distended glands, and the offensive odor associated with uncleanliness could induce an inexperienced physician to suspect definite cancer. Indeed, many cases are so close to the border-line as to render a conclusion difficult. Treatment will frequently establish the diagnosis. Puncture of cysts, and the application of caustics cause cicatrization of the surface and demonstrate the absence of malignancy. It has been asserted that Nabothian cysts absolutely contra-indicate the existence of cancer, but Nabothian cysts observed in the immediate vicinity of cancerous degeneration contradict such a statement. The absence of tissue friable to the touch, the use of the speculum, and, when necessary, the examination of an excised section should render the diagnosis of a benign condition positive.

Papillary erosion of the cervix is sometimes mistaken for carcinomatous ulcer, but the latter is covered with friable tissue which bleeds easily. In carcinoma the affected structure is raised above the level of the healthy cervix; in erosion it is depressed. The latter has a regular outline, the carcinomatous ulcer an irregular, ragged line of demarcation.

Necrosis of a fibroid polypus presents subjective symptoms similar to those of cancer. I recently saw a patient, a widow, forty-five years of age, who was suffering from a profuse menorrhagia, and a copious foul-smelling discharge. She had been assured by her physician that she was suffering from an incurable cancer of the uterus. The appearance of the patient and the odor in the room apparently justified the assertion; but a digital examination revealed a large mass filling the vagina. It was firm and resistant and could be moved about. The lower surface of this mass was roughened. The upper surface was smooth. The finger carried over it could reach a distinct pedicle, which could be traced upward into the uterus; the cervix was thinned, and at no point hard, indurated, nor infiltrated. Consequently, I did not hesitate to assure her that she could be cured.

Necrosis in a fibroid within the vagina is recognized easily. The firm resistance, well-defined pedicle, absence of infiltration about the external os, and the smooth regular outline render its benign character certain. A growth within the uterine cavity may be a more difficult problem. There a sloughing fibroid causes hemorrhage and a profuse offensive discharge, but the discharge usually is thinner, watery in character, and may contain particles of the growth, composed of sloughing tissue. The uterus is larger in outline, its cavity frequently open, permitting manipulation and contact of the finger with the mass within. Occasionally fragments of tissue may be removed and examined under a microscope, when their fibrous structure should exclude cancer. Dilatation of the uterus sufficient to permit the introduction of the finger discloses the cavity occupied by a more or less resistant mass which is not friable nor easily broken down.

Syphilitic ulceration should be distinguished readily from cancer by failing to find an excavated surface with indurated base and edges, by the presence of other evidences of syphilis, and the absence of friable tissue over the ulcerated surface. Microscopic examination generally is unnecessary.

Partial Retention of the Products of Conception. Retained tissues may be the embryonic envelope, a portion of the placenta, or blood-clots. These, when retained, are subject to infection, cause an exceedingly foul-smelling and offensive discharge, and their presence is a frequent cause of bleeding. The history of recent abortion or delivery, the dilated os permitting the introduction of the finger, and the recognition of the retained products by exploration determine the condition. The retained products scraped away, a smooth surface is left, which is the normal uterine wall. The absence of further irritation following cleansing of the cavity demonstrates its true character.

Chorio-epithelioma presents a history of previous abortion or labor within a few weeks or months, followed by such profuse, irregular bleeding, as to justify curetment which yields a large amount of soft, friable tissue. The hemorrhage is arrested briefly, and when it recurs, a second curetment reveals the renewal of similar structure. Chorio-epithelioma has a marked tendency to early metastasis through the blood-vessels. It occurs at an earlier age than carcinoma. The age of the patient, the history of previous pregnancy, the severe hemorrhages, the rapid development, and the recurrence should make the diagnosis certain. The structure can be differentiated positively from cancer only by use of the microscope. Examination reveals the material as epithelial, but differing from cancer in the absence of well-marked stroma. It resembles sarcoma, but differs from it in being composed of epithelial and not connective-tissue cells. Further investigation shows this epithelium to be a product of fetal life which has originated from the covering chorionic villi, the syncytial cells.

Sarcoma causes symptoms similar to those of carcinoma. It may be differentiated, however, when it affects the cervix, by the polypoid or grape-like masses projecting from it. Where the disease involves the body of the uterus, the organ is likely to become much larger than is the case in carcinoma. Sarcoma, however, is rarer than carcinoma. The microscope affords the only means for arriving at a positive diagnosis. The structure of the sarcoma is homogeneous, and consists of connective-tissue cells, either round, spindle, or giant cells, without a well-defined stroma; the walls of the blood-vessels are invaded and made to appear as mere sluiceways throughout the structure. In carcinoma the structure is nest-like, with a well-defined stroma, the vessels are situated in the stroma, and their coats are not destroyed.

It is seen that the existence of carcinoma does not preclude pregnancy. The existence of this complication renders it important that we should study its course and be able to determine its presence. The diagnosis is rendered easier by comparison of the hard, firm, infiltrated carcinomatous parts with the softer, edematous, healthy tissue of the pregnant uterus. The carcinomatous nodules of the portio vaginalis (vaginal portion of the cervix) may be recognized by touch and often as intervening between the finger and the parts of the child. Sometimes the initial stage of uterine cancer may be so slight as to be overlooked. Doubt should be dissipated by microscopic examination of the excised tissue. Even more difficult than the recognition of carcinoma is the determination of the existence of pregnancy in the earlier months. Pozzi claims that it is impossible to diagnose the existence of pregnancy with uterine cancer prior to the fourth month. A number of cases are recorded in which pregnancy was recognized first during or following a total extirpation. Pregnancy can be overlooked readily in the second and third months. The earlier it is recognized, the better, for the increased congestion which occurs during pregnancy favors the more rapid development of the disease. Formerly, the existence of pregnancy during cancer was believed to allay or arrest the progress of the cancer only to accelerate it subsequent to the termination of the pregnancy, but careful observation has demonstrated the fallacy of this view. On the contrary, the increased nutrition which is directed to the uterus by the occurrence of pregnancy favors the more rapid development of malignant disease. Recognition of the existence of carcinoma, as determined by the microscopic investigation of the excised tissue and the simultaneous enlargement of the uterus, should cause pregnancy to be suspected.

The duration of cancer is hard to determine as it makes its appearance so insidiously that its beginning is rarely recognized. We have no means of knowing how long a period transpires between its origin and the ulceration which drives the patient to consult a physician. Naturally when the disease is suspected immediate resort is made to measures for its eradication. The form of the cancer is also a determining factor. The soft medullary cancer progresses rapidly and is destructive in its action. The final catastrophe occurs much sooner than in scirrhus. The earlier in life the disease develops, the more rapid, as a rule, will be its progress. The period of survival varies, according to different authors, between six months and two or three years; in squamous-cell cancer, from three to four years; in cylinder cell cancer, from six months to two and a half years. A somewhat longer period is ascribed to cancer of the body. The normal duration of life can be materially altered by therapeutic measures. Cases are seen in which, after operation, months or years passed without any indication of relapse. This is true not only after radical operation, but the patient so improves after the arrest of hemorrhage and discharge by some palliative measure as almost to cause the patient and her friends to doubt the possibility of the disease being of so serious a character.

Prognosis. It is only necessary to study the clinical course of carcinoma to be convinced that the prognosis is bad. The improvement of the prognosis lies, first, in early recognition of the disease; second, in prompt resort to radical operation. The first provision requires recognition even before the characteristic symptoms of the disease are manifest. A patient in whom the irritative conditions favorable to the development of malignant disease exist should be kept under observation, and during the period of greatest susceptibility should be subjected to a quarterly, or at least a semi-annual, examination. Causes of special irritation should, as far as possible, be removed by appropriate treatment. Second, radical treatment should be understood as a procedure which will insure removal of the diseased structure within the limits of healthy tissue. To accomplish this with the greatest safety, the operation necessarily must be early. The probability of rapid invasion of the deeper structure, and establishment of secondary nests more or less remote from the original site, is less marked in cancer of the body of the uterus than in that of the cervix or the vaginal portion. Cancer of the uterus in a woman prior to the age of forty years is more acute in its progress and more likely to recur than in women of more mature years. The prognosis of the disease is materially affected by the thoroughness of the operative procedure and by the precautions which are exercised to prevent reinfection of the new wound. Inability to determine when and to what extent metastasis has occurred renders the surgeon unable to fix the prognosis after operation with any degree of certainty in the individual case. An apparently hopeful one will soon relapse, and one for whom the outlook seems uninviting will remain for a long time relapse free, dependent upon obscure processes whose rationale are not fully comprehended.

The outlook for length of life of the patient suffering from uterine cancer is affected largely by the occurrence of pregnancy as a complication. The prognosis of pregnancy depends upon the kind and course of labor and general condition of the patient; above all, upon the extension of carcinoma. The more difficult the labor, the poorer the general condition of the patient, and the more progressive the disease, the more certain will be the unfortunate result and probable death. The outlook of the woman suffering from cancer with a pregnant uterus is far worse than for the non-pregnant, because pregnancy and labor occasion extremely dangerous results. The rapid progress of the disease during pregnancy, the severe trauma during labor, and the rapid carcinomatous degeneration of the tissue affect the result. Chantreuil reported that in sixty pregnant carcinomatous diseased women twenty-five died during or shortly after childbirth. Cohnstein, in one hundred and twenty-six cases, saw seventy-two die. Hermann had one hundred and eighty cases in which seventy-two died. The uterine rupture alone had six victims out of Chantreuil's sixty cases; eleven out of Hermann's one hundred and eighty; nineteen out of one hundred and twenty-six women, according to Cohnstein, died undelivered—about 8.1 per cent. of all the cases. Under the uniform methods of treatment employed of late years, the mortality is somewhat decreased. It is now admitted that the treatment of complications of pregnancy must be consigned to operative procedure, either gynecologic or obstetric. Formerly the treatment was limited to artificial abortion and premature labor. But little experience, however, was required to demonstrate that such measures were ineffective. The course then advised was to prolong the pregnancy as long as possible with a view to securing viability for the child, and the obstetric operation became the important consideration. Later experience in the various methods of treatment has led to the following conclusions: 1, In cases in which the cancer has reached a stage where radical operation is impracticable every effort should be made to prolong the pregnancy until the child becomes viable; 2, where the patient, however, is recognized to have the disease in its early stages, with a reasonable hope for successful removal, the ovum should not for a moment be permitted to prejudice the chances for the mother, and radical operation should be undertaken without reference to the child.

Treatment. Study of its anatomic structure and progress of development indicates that cancer originally consists of a primary nest, from which invasion of the surrounding structures occurs. The rational treatment, then, consists in the removal of the diseased structure within healthy limits. Upon the extent of involvement will depend our ability to remove completely the disease, and hence the division into two classes—*radical* and *palliative.* The following scheme represents the methods of treatment which may be adapted to each class:

A. Radical.	1. Partial extirpation,	Vaginal.
	2. Total extirpation,	Vaginal. Abdominal. Sacral.
	3. Palliative operations,	Cureting. Caustics. Cautery.
B. Palliative.	4. Injections,	Hypodermic. Cleansing.
	5. Anodynes.	

326. Radical Operations. *Partial Extirpation of the Vagina.* As carcinoma uteri largely preponderates in the cervix, it is quite conceivable that the early operative procedures were directed to the extirpation of that section of the organ involved. Von Grafenberg, as early as 1600, reported that the uterus had been normally extirpated in a number of cases, but it is most probable that the majority of these were amputations of the cervix, particularly as the subsequent continuance of menstruation is noted in several women, and, indeed, the birth of children. In the early cases hemorrhage was controlled by styptics, and many of the patients succumbed to hemorrhage and sepsis.

Partial extirpation has remained, until the last twenty years, the principal, if not the exclusive, operative method of combating carcinoma. It consisted in the removal of the diseased parts with knife or scissors, and the control of hemorrhage with the cautery or strong fluid caustic. The difficulty in controlling hemorrhage led to the employment of the chain or wire écraseur, by which the diseased tissue was crushed. The use of the galvanocautery loops was a marked improvement. The galvanic loops were placed upon the cervix above the margin of the disease and tightened until the cervix was amputated. C. Braun and Byrne practised this procedure extensively with extraordinary results. The latter made it still more effective by substituting the galvanic knife for the loop.

Neither the employment of the écraseur nor the use of the loop can be considered as an ideal surgical procedure. With the first, injury of the neighboring organs cannot always be avoided, and, with the second, it is not always possible so to place the loop that amputation of the vaginal portion of the cervix results with certainty in healthy tissue. A more progressive method was instituted by returning to amputation with the knife and union of the wound surfaces by sutures. The procedure was introduced by Hegar, who made a funnel-shaped incision. Schröder perfected supravaginal amputation of the cervix, a method capable of meeting all the requirements of the present partial uterine extirpation per vaginam.

Amputation of the Cervix with the Galvanocautery Loop. The preparation for vaginal operation (§ 131) is made, exercising care to penetrate and disinfect the neck. The cervix is exposed with specula or retractors, seized and drawn upon with hook forceps which dip into the healthy tissue, while the platinum loop is placed as high as possible, coming immediately under the transverse folds which indicate the position of the bladder, and is so tightened that it cuts into the tissue. As the excision progresses the vagina is protected from heat by wooden plates and syringed several times with water in order thus to cool the tissues and preserve them from burning. The wire must be kept at a red heat in order that the surfaces shall be well scorched. The wire should be tightened slowly until the cervix is cut through. When the operation is accomplished with due deliberation, there is no tendency to subsequent bleeding. The higher the wire is placed upon the cervix, the more probable it is that Douglas' pouch will be opened. The occurrence of such an accident, however, requires no more consideration than to pack the cavity with iodoform gauze. By using the galvanocautery knife Byrne improved the operation. He cut around the vagina, separated it from the cervix which he was enabled to remove at a higher level.

Hegar's Operation. The funnel-shaped amputation of the cervix described by Hegar is accomplished as follows: The cervix is fixed by double tenacula and drawn downward. A knife is introduced as far away from the limits of the disease as safety for the bladder and ureters will permit, and is carried about the cervix, held at such an angle as to cut out a cone-shaped mass, the apex of which would be high in the cervical canal. The hemorrhage is controlled by sutures and tamponade. Baker operated in a similar manner, but controlled the hemorrhage with the cautery, while Van de Warker cauterized the surface with zinc chlorid.

Schröder's operation is a supravaginal amputation, as follows: The cancerous portion is exposed by Simon's retractors. With a sharp curet all removable tissue is scraped away from the new formation until the curet reaches firm tissue, when the entire bleeding surface is scorched with a hot iron, the vagina being protected from the heat and frequently irrigated as the operation proceeds. The cervix is seized with a vulsellum and drawn downward as far as possible. An incision—if possible, one centimeter from the disease margin—is carried about the cervix; with the index-finger or a gauze pledget the bladder is separated bluntly from the anterior uterine wall. The bladder and ureters are thus shoved upward, when the anterior wall of the neck can be removed at a high level. In this operation Douglas' space is frequently opened, but the cervix is retained in connection with the lateral parametrium. The cervix is pulled to one side, while with a Deschamps needle a ligature is passed as far away from the cervix as possible, tied firmly, and the tissue cut between the neck and the ligature. If the tissue is thick, a number of ligatures may be applied, one above another, and when the opposite side is likewise treated, the cervix is cut away. When necessary, all the cervix below the internal os can be removed. If Douglas' pouch is opened, the circumstance may be made useful in closing the parametrium, as the needle can be passed upon the finger, introduced through the opening. The cervix is then amputated at the level of the internal os. The section is made through the anterior vaginal wall to the cavity, and, before proceeding further, the anterior vaginal wall is stitched to the anterior cervical wall with two or four sutures. The amputation is completed by cutting through the posterior wall, when the surfaces are sutured as in the anterior. A number of sutures are now applied to the lateral portions of the wound to insure closure. The sutures should be carefully placed in the lateral angles in order to secure the uterine arteries. When they are secured ineffectually, hemorrhage may be free and threaten a fatal result. The patient can arise in from ten to twelve days and be discharged after eighteen to twenty days.

The high amputation of the cervix has had many advocates, who champion it in preference to extirpation as being safer and less prone to subsequent relapse. The employment of the galvanocautery knife may produce a beneficial influence in the destruction of cancer nests which would be overlooked by the scalpel. An objection to the operation is that the cervical opening may contract and become closed, causing subsequent distress, and necessitate further operative procedure to relieve the dysmenorrhea or hematometra. Cases of pregnancy have been reported where the difficulty in labor was so great, because of the scar tissue, that operative delivery was required and the patients died. Similar experience has been observed in the Hegar operation, owing to the difficulty in introducing the sutures. All these disadvantages are avoided by the Schröder operation.

The investigations of Seelig have demonstrated that infection has been carried through the lymphatics to the cervix, and even to the body, of the uterus. Such an occurrence would render anything less than extirpation of the entire organ of no service, and no positive means exist for determining when it has taken place. An additional reason for preferring the entire extirpation is that the cicatricial tissue is always irritable, and is a source of danger in a woman predisposed to undergo malignant change. The removal of the uterus and ovaries brings about a lessened congestion of the pelvic tissues, and will certainly leave the patient free from subsequent periodic engorgement of the pelvic structures. The cases suitable for the partial operation are not frequent.

Total extirpation of the uterus in isolated cases has been mentioned as having occurred at various times during the eighteenth century, but it remained for Czerny and Freund to formulate procedures which have led to more complete and satisfactory methods of vaginal and abdominal hysterectomy of the present day.

Total extirpation may be undertaken in one of two stages of development: first, when no evidence of involvement of the parametrium exists, when the object is to eradicate the disease by ablation of the organ and the surrounding portions of the vagina and parametrium, or to operate within healthy tissue; second, when there is some involvement of the parametrium with fixation of the uterus. The latter operation is not curative, but may ameliorate symptoms.

In performing the radical operation two purposes should be kept in mind: 1, To keep beyond the confines of the disease by operating in healthy tissue; 2, to protect the patient from any possibility of reinfection.

1. Recognition of the processes of development and extension of cancer, is too uncertain in any individual case for the surgeon to be able to determine definitely, prior to operation, that circulatory or irritative extension has not involved the parametrium beyond the safe limits of operation. In some this transmission may occur early in the disease, in others late, so that usually in a woman with but slight involvement and no demonstrable evidence of extension a favorable prognosis is given. However, in these cases the surgeon frequently is horrified to find a recurrence after a very brief period, while in others the entire vaginal cervix may be destroyed, a radical operation is done with a hope of amelioration only, but the patient remains free from recurrence for years or even permanently.

2. The possibility of reinfection or of implantation of portions of cancerous structure on a healthy wound and the reproduction of the disease from it has been questioned. Such an explanation for the redevelopment of cancer in a wound where microscopic investigation indicated that the operator was well beyond the confines of the disease seems reasonable. The opponent of infection, however, justly instances the possibility of metastatic nests in the parametrium, discoverable only by the microscope, from which the recurrence has followed. Such allegations for the vicinity of the wound are difficult to combat, but if, in a single case, the disease can be transplanted to the abdominal wound in an abdominal hysterectomy, it should be considered proof that such implantation may occur, for that region would be entirely out of the usual route for metastatic extension. Such an infection came under my observation in the practice of one of my colleagues, in a young unmarried mother. Within two months after an abdominal hysterectomy nodular masses were observed in the abdominal wound, which subsequently progressed. In two of my cases implantation has occurred. In both involvement was extensive and the cervix was occupied by a squamous-cell carcinoma. The first patient had a sinus in the abdominal wall following a stitch abscess in which proliferation of the epithelium occurred, resulting in a spreading sore which involved the tissue circumjacent to the abdominal incision.

As this patient had pelvic involvement as well, the possibility of continuous extension must, of course, be considered, although I was apparently able to excise the infected abdominal tissue without opening the peritoneal cavity. The second patient, an unmarried woman, underwent operation June 19, 1900. The entire cervix was involved in so extensive a cauliflower growth that her attendant, a surgeon of considerable experience, questioned the advisability of operation. She was exceedingly anemic and broken down by repeated hemorrhages. She was continually nauseated and vomited everything taken for five days subsequent to the operation. At the close of a week it was found that all the sutures had cut through, the wound was gaping, and the intestine protruding. The wound had been closed with silkworm-gut sutures for all the tissues above the peritoneum, and continuous chromic catgut for the latter and the aponeurosis. The intestines were packed back with gauze, and a week later the wound was closed with through-and-through silkworm-gut sutures under cocain anesthesia. The patient left the sanatorium five weeks subsequent to the performance of her operation, with good union in the abdominal wound. Much to the surprise of her attendant and myself she enjoyed, barring a very small ventral hernia, excellent health for over two and one-half years. She then began to have discomfort and swelling in the line of the wound, and a lump could be felt which was thought to be a strangulated and inflamed projection of the omentum. However, the mass gradually increased in size and became painful, and, therefore, a provisional diagnosis of recurrent malignant disease was made. This was excised June 18, 1903, three years from the date of her previous operation. Nearly four years after the second removal she developed a recurrence in the pelvis. She died June, 1908, eight years after the original operation. At the second operation a mass of infiltrate as large as a hen's egg occupied the center

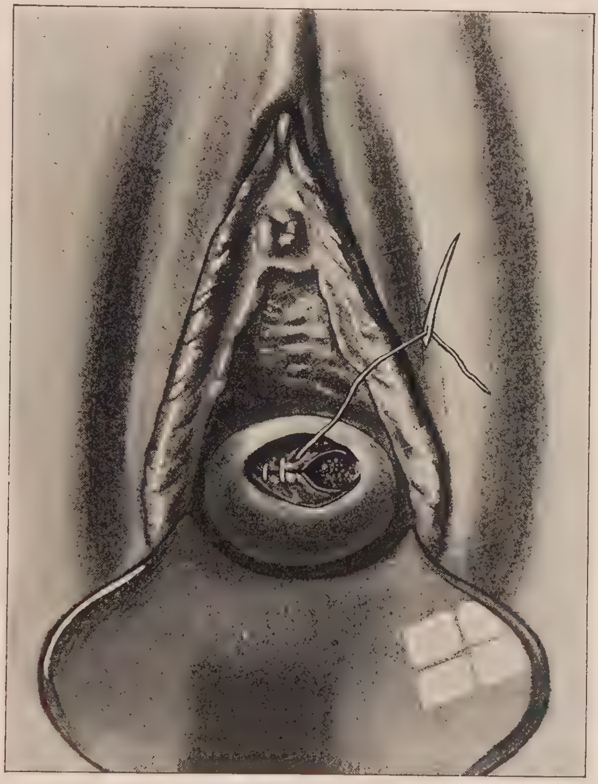


FIG. 537.—Formation of Flap to Cover Diseased Surface Preliminary to Operation.

of the cicatrix. The omentum and a portion of the ileum were adherent and had to be separated with scissors; a portion of the intestine also was involved in an annular band of tissue, for which three inches were excised and united by an end-to-end anastomosis. Careful examination failed to reveal any other evidence of the disease, the pelvis disclosed no sign of any infiltrate or glandular enlargement, although careful observation was made. It may seem that the two and one-half years which intervened before the development of this growth would argue against implantation, but is it any more difficult to consider transplanted cells as lying latent and inactive in this area than it is for those which have been transmitted to the parametrium to develop within the five years, a period which all authorities admit should transpire before a case can be pronounced as cured?

Whether we accept or reject the theory of infection, the precautions taken to prevent it are only such as will be of service in rendering the parts sterile and in preventing infection from pathogenic germs, which every one will admit are present.

Preliminary Treatment. In every extirpation of the uterus, whether per vaginam or through the abdomen, in addition to the preparation indicated in § 131, precautions should be exercised to remove all diseased and disintegrated tissue. The surface should be gone over with a sharp curet, all loose and ragged edges trimmed with scissors, and the superficial structures thoroughly scorched with the thermocautery. Sutures should then be introduced to close up the diseased surface. If the entire vaginal cervix is more or less involved, incisions should be made upon each side which will permit flaps to be turned down and sutured over the diseased structures. In many cases a number of tenaculi may be used for the double purpose of closing the cervix and for traction and control of the cervix. The vagina should be irrigated continuously during the process of closing off the diseased surface and this procedure followed by careful sponging with a solution of sublimate in alcohol (1:500).

Vaginal Hysterectomy. Many isolated cases of extirpation of the uterus per vaginam are found in the literature of the last century, notably those of Langenbeck and Sauter-Recamier. Czerny, on August 12, 1873, revived the operation. The operation has also been variously modified. The following method should be pursued:

1. After the preliminary preparation directed (§ 131), place the patient in the lithotomy position, expose the uterus with an Edebohls speculum and lateral retractors, make traction upon the cervix with double tenaculum, vulsellum, or a silk loop passed through it, draw it down as near to the vulvar orifice as possible, and close the cervix by sutures, making flaps where necessary to cover the diseased tissue. Sterilize the hands and the instruments so far used. It is well to wear rubber gloves for this procedure and to change them before the next.

2. Separate the cervix with scissors, knife, or thermocautery (preferably the latter) from the vaginal wall by an ovoid incision, extending it as far away from the diseased tissue as safety for the bladder and ureters

will permit. This can be carried higher on the posterior surface without the fear of injuring the rectum. The thermocautery knife has the advantage that it decreases hemorrhage, destroys additional infected tissue, and prevents immediate union, thus favoring better drainage.

3. Push back the bladder from the anterior wall of the uterus and from the broad ligaments with the finger, a sponge or with the handle of a knife. Where desirable to remove a large portion of the parametrium, expose each ureter and place upon it a traction ligature, as suggested by Bovée, when the uterine artery can be traced out and ligated near its origin.

4. The section of the portions of broad ligaments containing the uterine arteries permits the uterus to be drawn out still further. If it has not already been done, the peritoneum should be opened back and front when the uterus is held only by that portion of the broad ligaments containing the uterine arteries. The left broad ligament external to the tube and artery is ligated, secured with a hemostat, and cut toward the uterus. The remaining broad ligament—the right—is easily treated in the same manner. Bleeding vessels should be sought, secured with hemostats and ligated.

5. Unite the peritoneal surfaces front and back to the edges of the vaginal mucosa. Secure the stumps in the angles of the wound with sutures so introduced and tied that they act as an additional ligature. Close the intervening opening between the stumps by a purse-string suture in the peritoneum, then push back the stumps behind the vaginal wall and suture the vaginal edges. Cleanse the cavity and pack the vagina loosely with iodoform gauze.

All sutures should be of catgut, as silk is likely to become infected, produce a discharge, and maintain a sinus until it comes away, which may require months, unless previously removed. Such a state keeps the patient in constant apprehension that the disease is returning. The disposition of the ovaries and tubes will depend upon their situation and the extent of the disease. If they are easily displaced downward, they should be removed; if high up, requiring considerable manipulation to displace them, they may be permitted to remain, as they cause no trouble. Before closure the wound should be inspected carefully for any bleeding vessels, as it is not impossible that a ligature may slip and a fatal hemorrhage result. Bleeding points should be picked up and secured with separate ligatures.

The treatment of the wound must depend on the condition of the patient. Thus, if she is much debilitated and it is undesirable to keep her long under an anesthetic, the wound may be packed between the stumps with iodoform gauze, carrying the latter sufficiently high to prevent the intestine from coming in contact with the raw surfaces. The gauze packing is placed lightly in the vagina and the vulva covered with a pad. This packing, when the blood control has been complete, may be permitted to remain from four days to a week. Upon its removal the cavity is irrigated with a 1 per cent. salt solution, and may be repacked lightly, although the packing should not be carried as high as the first portion.

The anterior and posterior walls of the vagina are thus permitted to fall together and become adherent. If there is no tendency to displacement of the viscera downward and the belly of the patient is not distended, the gauze need not be replaced, and the vagina may be kept clean by irrigation. In relaxed vagina, or when the condition of the patient will permit of more time for the operation, the ends of the broad ligaments should be united laterally in the vagina by a deeply passed suture, which, when tied, holds up the vagina and avoids its subsequent relaxation for want of support. For further steps in the procedure see 5. above. The patient should be confined to bed for two weeks; frequently cases are permitted to rise earlier than this, but the long rest in bed is no disadvantage. The pelvic floor is firmer and less likely to prolapse subsequently.

Various modifications of the operation of vaginal hysterectomy have been suggested. Three years after Czerny introduced it, Sänger was able to collect thirteen different methods of operating, and each year since other modifications have been suggested. Mikulicz was the first to use the curet. Billroth and Olshausen added scorching the surface with the thermocautery; others, in addition, cauterized with carbolic acid or chlorid of zinc, or used iodoform, liquor ferri chloridi, alcoholic bromin solution, and absolute alcohol. Tauffer made his preliminary preparations several days before the operation, and Leopold advocated disinfection as the first step. Schauta began the operation with the thermocautery. Bottini, Wecchi, and Calderini amputated with the galvanocautery loop, and followed with extirpation. When cancer is situated high in the cavity of the uterus, antiseptic syringing is practised, the cavity packed with iodoform gauze, and the os closed over it with sutures or with fixation forceps. In order to limit the discharge of secretion in carcinoma of the body, Schauta introduced a tupelo tent into the cervix. This tent was somewhat constricted in the middle from perforation, and a thread was introduced, the ends of which were armed with needles. These needles perforated the cervical canal anteriorly and posteriorly, and the ends of the suture were tied over the end of the tent. The swelling of the tent acted as a plug to the cervical canal. Mackenrodt introduced the formation of flaps from the anterior and posterior vaginal surfaces, which we have described. Landau advocated an ovoid incision, the posterior surfaces somewhat higher than the front, as such an incision gave greater accessibility to the operation field. Doyen lengthens the circular incision by one right and left, in order to create a still larger opening, and especially to be able to separate about the bladder and the ureters more securely. Fritsch incised both sides of the vagina; the base of the broad ligament is cut and tied, so that in this manner the uterus is easily movable and readily drawn down before the cervix is separated from the anterior and posterior union. Schatz opens into Douglas' space; then the uterus is completely freed from its lateral union, and, finally, the bladder is separated from the cervix. The ureters have been injured in this method of operating. Billroth separates by degrees the broad ligament, ligates the individual vessels, and fastens the broad ligament in a properly prepared fixation forceps. Schroder drew the uterus through the opening of Douglas' space into the vagina. This procedure is not always performed with ease. Fritsch rotated the uterus through the anterior peritoneal opening. Olshausen operated with the uterus continually *in situ*, and endeavored to separate it first on that side which showed the least invasion by cancer. Corradi and P. Müller rendered removal of the uterus easier by dividing it into two portions by a sagittal section, and then removing each half singly. Kelly divides it into four or more. This procedure, without question, renders the removal of the uterus more easy, but if we believe in the reimplantation of the cancer cell, it greatly increases the danger. The ligation of the broad ligaments has also given great variety of procedure. Some ligate small sections; others ligate in mass. Olshausen, in the beginning, attempted to surround the broad ligament with a single ligature, but the stump would shrink and the vessel retract from the ligature and considerable hemorrhage result. Liebmann attempted to ligate the parametrium in such a manner that the ligature is knotted on the vaginal mucous membrane in order to limit its slipping. The superior part of the broad ligament, with the spermatic vessels repeatedly slips from the ligature and requires supplementary ligation, which is accomplished with great difficulty. Veit fastens the superior part of the stump with hook forceps and ties the ligament behind them.

With regard to the removal of the ovaries there has been considerable discussion. Czerny, in his first case, removed the appendages supplementary to the removal of the uterus. Schröder, Olshausen, and others leave them when no indication of disease is found. Von Teuffel and Kaltenbach urge their removal; the latter emphasized the possibility of infection of the peritoneum by leaving inflammatory diseased portions of the tube. The retention of the appendages in carcinoma of the uterine neck is not found to favor the appearance of relapse. The course of the lymph-channels arising from the cervix has no relation to the appendages of the uterus, which always should be removed whenever pathologic alterations are recognizable. After Reich, in several cases of carcinoma of the body, had demonstrated cancerous disease of the ovary, the removal of the appendages was advocated in all cases in this form of uterine cancer. Formerly surgeons employed irrigation freely with strong antiseptics during the early part of the operation. To-day, the majority of gynecologists, after radical disinfection of the field of the operation, proceed with sterilized instruments without irrigation. Irrigation should be employed only when necessary to cleanse the field, and it is better then to use nothing stronger than normal salt solution or a 1 per cent. saline solution.

The vaginal operation will be especially difficult if the canal is narrow and rigid or the uterus very large. Under such circumstances the majority of operators have incised the vaginal wall or the paravgainal tissue, which increases the lumen of the vagina considerably Von Winckel, in one case with enormous narrowing of the vagina and a large uterus, split the entire rectum and rectovaginal septum up to the vaginal vault. The large vaginorectal wound was sutured with silk, and recovered by primary intention. Dührssen made a deep vaginal incision, which penetrated from the vaginal vault and completely opened the ischiorectal cavity and the entire vagina. Section on the right side penetrated the vagina, and also the rectum, to the depth of six or seven centimeters. By this incision not only the vaginal tube, but also the surrounding muscular structure, the levator ani, and the constrictor cunei are separated. The direction of the incision is in the middle line, between the tuber ischii and the anal opening. By such an incision the entire field of the operation is incidentally increased, and the resistance of the soft parts of the pelvic cavity is removed. The hemorrhage from the vagino-intestinal incision is either controlled by ligature or through pressure of retractors. After the removal of the uterus the wound is closed by sutures. After such an incision relapses have occurred in the scar tissue, which are evidently infection relapses. Schuchardt creates a still larger accessibility to the field of operation by opening more widely the ischiorectal cavity. He makes two accessory incisions. One splits the entire lateral vaginal wall, from below to the neck; on the other side a long vaginal incision from behind progresses to the sacrum and encircles the rectum, bow-like, in an incidental sagittal section. The long incision is made upon the side in which the parametrium is involved strongly, and extends to the outside of the convex bow at the side of the anus. The extirpation of the uterus in these operations differs from the usual vaginal extirpation only in that the parametrium has been opened up so that some cancerous nodules can be removed therefrom without exposure of the ureters. The vagina is closed from above downward by knotted suture.

While it cannot be denied that these extensive vaginal incisions permit greater freedom in the manipulation of the uterus, the ease with which it can be reached from above would seem to contra-indicate such a method of procedure, especially in view of the increased danger of reimplantation upon parametric tissue which must be associated with so extensive a dissection. To facilitate the removal of larger portions of the parametrium with safety, Pawlik, Kelly, and Clark advocated prior to operation, the introduction of catheters into the ureters to establish their position more definitely and permit, with safety, the more extensive removal of the parametrium. The dissection and guarding of the ureters, as Bovée suggests, are preferable and safer, for one case of catheterization has been reported in which the catheter was broken off and the patient died. Catheterization inflicts more or less trauma and, therefore, predisposes to infection. Mackenrodt, in total extirpation, cuts about the vagina some distance from the portio and prepares anterior and posterior flaps, which are drawn over the portio and sutured so that the diseased tissue is completely covered. He splits the anterior vaginal vault by a median incision from the urethral swelling to the circular incision. The accessibility of the operation field is still further increased by a deep vagino-intestinal incision. The bladder is dissected from the cervix, and especially from the broad ligaments, and therewith the ureters are separated some distance; and, finally, the uterus, with as large a portion as possible of the parametrium, is extirpated. The peritoneal wound is closed after the contraction of the stump, the vagino-intestinal incision narrowed by suture, and the vagina, with the supravaginal wound, packed with iodoform gauze. Later, Mackenrodt performed an operation in which the extirpation of the uterus and of the greater part of the vagina was accomplished with the hot iron. He believes that a larger portion of the vagina must be removed than is customary, because we do not know that a latent contact infection of the vagina does not already exist. He performs the operation as follows:

With cutting instruments, Paquelin cautery, or galvanocautery the entire vagina, or at least the upper half of it, is separated; a vaginorectal incision is made which extends to the portio and lays open the operation field; then the vagina is seized with forceps and separated downward by hot iron. If the upper part of the vagina only is removed, we begin with a circular incision in the middle of the vagina. After extirpation of the vagina the portio is secured with forceps and Douglas' cavity is opened with a hot iron. The bladder and the broad ligaments are separated from the cervix by a properly constructed shovel forceps, drawn as far as possible to the outside, and separated by the cautery. After the separation of the base of the broad ligament of both sides spurting vessels are seized with Koeberle forceps, which are placed in the higher part of the broad ligament, separated by the cautery, and the stump scorched. The now very movable uterus is easily inverted. The upper parts of the broad ligaments are fastened with Richelot's clamps and a ligature is placed on each side, after which the separation of the stump results. After the removal of the uterus the rectovaginal incision is closed by sutures, when, in spite of the scorching, primary union usually is obtained. The perineum is not sutured. The burned cavity is filled with iodoform gauze. Elevation of temperature follows. Of ten cases subjected to this operation, two suffered from sepsis.

Byrne has removed the entire uterus by the galvanocautery, but used the knife instead of the loop. Winter and Frommel combat the possibility of the danger of contact infection of the vagina being great enough to justify such a procedure. Czerny, Franck, and others have pursued the method suggested by Langenbeck who separated the uterus from its peritoneal envelop, and united by sutures the several resulting tears in the peritoneal covering. This operation sometimes is easily done, but at other times is extremely difficult. Richelot and Péan advocate the use of clamps instead of the ligature. The preliminary steps of the operation are performed similarly to those already described. After opening the peritoneum in front of and behind the uterus, the organ is held by the broad ligaments, through which enter the uterine and ovarian arteries. Clamp forceps are applied at each side of the cervix, upon about one-half of the broad ligament, and the structure is cut between the cervix and the clamp. The uterus is drawn down, if preferred, and the fundus is brought forward and through the anterior fornix; clamp forceps are applied from above upon the remaining portion of the broad ligament. The section between the clamp and the uterus frees that organ, which can be removed. The clamps are then held apart, the surfaces are separated by retractors, and careful inspection is made to determine that all bleeding vessels are controlled. Any spurting vessels should be secured with smaller clamp forceps or the arteries should be ligated. Iodoform gauze is carried into the vaginal canal between the clamps to the point at which the peritoneum has been separated, and is packed loosely between the clamps. The gauze should be carried over the end of the clamps, so that the coils of intestine may not impinge against them and become injured. The operation has the advantage that it can be performed very expeditiously, and requires much less time than the application of the ligature. It has the disadvantage that the tissue within the grasp of the clamp undergoes sloughing, causes a foul discharge, an offensive odor, and sloughing tissue which makes the infection of the peritoneal cavity easy. The convalescence of such patients is usually attended with considerable elevation of temperature.

Tuffier reports twenty-seven cases of vaginal hysterectomy without the use of forceps or ligatures. The uterus was bisected, one-half drawn out of the vulva, the finger passed behind the upper part of the broad ligament, and the included tissue grasped between the blades of a powerful clamp, the angiotribe, which is tightly screwed. The tissues are thus crushed and the artery is occluded. After the crushing of the tissues the ligament is cut through and the upper part of the broad ligament crushed in a similar manner. It is very important that the handle should be secured as tightly as possible and the blades kept in the axis of the vagina. In none of the cases reported had any accident occurred during the operation and absence of hemorrhage was particularly noted. Dr. Newman, of Chicago, also advocated quite strongly the use of the angiotribe, but it cannot always be relied upon for the control of hemorrhage, and in some cases tears the vessel, making its control by ligature difficult. Dr. Downes, of this city, has greatly improved upon this method by the use of electro-hemostasis.

The late Dr. Joseph Eastman placed the patient in the Sims position, stretched the anus to allow greater readiness of access to the pelvic cavity, retracted the perineum with a Sims speculum, and made an incision about the uterus, which opened the Douglas culdesac posteriorly and between the bladder and uterus anteriorly. He then passed a curved staff over the broad ligament, by which a ligature was carried and the broad ligament secured *en masse*, then over it was passed a pair of interlocking forceps by which the broad ligament was constricted, preliminary to its being severed, after which the ligament could be ligated in sections or the clamp permitted to remain. The other broad ligament was treated in a similar manner. The advantage he claimed for this procedure was greater security and control of hemorrhage, and that the vagina was held at a lower level and its prolapse prevented. The position of the patient, with the preliminary dilatation of the anus, gives greater freedom of access to the uterus.

Accidents of Vaginal Total Extirpation. The most frequent injury is that of the bladder, which can take place in various ways. Thus, it may occur in the blunt separation from the anterior cervical wall. The danger of this becomes greater the more closely the new formation has approached the bladder. If it has passed over to the external layer of the bladder-wall, we may readily puncture or tear the bladder in the most careful separation. When the bladder is infiltrated, the preferable plan is to cut out the diseased tissue and close the opening by sutures. Injury of the bladder is recognized, however, most frequently for the first time at a longer or shorter period after the operation, when a part or the whole of the urine is lost through the vagina. Either a small bladder injury has been overlooked, or, what is probably more frequent, the bladder has not been separated sufficiently from the ligament, and in placing the ligatures upon the parametrium a portion of the bladder is fastened in the ligature, so that a slough of the affected bladder-wall occurs. A spontaneous closure frequently results from the scar retraction. When it has not closed, the repair of the fistula must be undertaken by operation. Kaltenbach claims that injury of the urinary apparatus occurs in about 10 per cent. of all cases; this, for the last few years, should be too high.

An injury of one or both ureters is occasionally observed. The injury can be avoided if the bladder and ureters are well pushed back. It does not require the previously mentioned sounding of the ureters to avoid ureteric injuries. One should exclude cases from operation in which the parametrium and the surroundings of the ureter are infiltrated with carcinoma. In such cases the shoving back of the ureter is exceedingly difficult, and frequently is associated with injury. The most serious injury of the ureter consists in the application of a ligature upon it or upon the tissue about it so that it is laterally compressed. Ligation of both ureters is, without question, fatal, and the ligation of one manifests considerable gravity. Schatz does not believe the ligation of one ureter necessarily unfavorable, as the other kidney performs increased duty. He also believes that in one case after ligation of the ureter the canal again became penetrable a few days later. A number of operators have had to remove the corresponding kidney as a result of ligation of the ureter. Zweifel, in double-sided ureteric ligation loosened the ligatures on the one side, forty-eight hours after the operation, and the strongly swollen ureter was made accessible again to the bladder; but as urine retention continued six days after the operation, the ligature on the other side was removed and the restoration of the ureters attained.

Injuries of the rectum are less likely to occur. They take place in especially unfavorable cases where adhesions exist between the uterus and the rectum. Frommel reports a case in which, in an attempt to open Douglas' space, the adherent rectum was injured, and, in spite of the most carefully introduced sutures, he lost the patient from septic peritonitis. In rare cases communication between an intestinal loop and the vagina has occurred, with involuntary fecal discharge. This is most generally from relapse in the operation scar, in which the carcinoma extends upon an adherent loop of intestine. Numbers of cases are reported in which ileus has resulted from adhesions in the open peritoneal wound. It was my unfortunate experience to have this occur nine years after the original operation. In symptoms of ileus the intestinal loop should be separated from the vagina after reopening the wound. In old cases the condition is best treated through an abdominal incision. If this fails, an artificial anus should be made or the affected loop of intestine should be resected.

Abdominal Hysterectomy. The first systematic operation for the removal of a uterus for malignant disease through an abdominal incision was performed by W. A. Freund, on the 30th of January, 1878. The operation has undergone a number of modifications since his introduction of it. After preliminary preparation (§ 124 to § 132) the operation is performed as follows:

1. The patient is placed in the lithotomy position, the friable tissue is removed from the cervix with the finger and spoon curet, all loose and ragged edges are trimmed with the scissors, the surfaces seared with the thermocautery, and the lips sutured to close in all infected tissue. Where this cannot otherwise be accomplished, flaps should be dissected. A folded piece of gauze is inserted in the vagina with one end protruding from the vulva. Before proceeding further, the gloves should be changed and the instruments which have been used discarded or resterilized.

2. The patient is placed in the Trendelenburg posture and an incision made in the median line from three centimeters above the symphysis to a short distance below the umbilicus, through which the intestines are pushed toward the diaphragm and walled off by gauze.

3. The uterus is secured by a double tenaculum and vulsellum forceps or sutures which have been passed through the fundus, drawn up and the upper part of each broad ligament clamped, taking care not to include the ureter. The round ligament should be secured by a separate clamp well toward its outer end.

4. Cut the broad ligaments internal to the clamps, secure bleeding from the uterine side by hemostatic forceps, join the extremities of the broad ligament incision by one through the anterior peritoneum above the bladder, and strip it and the bladder away from the cervix and broad ligament.

5. Spread out the broad ligament so as to expose the ureter. Push the finger along its course under the uterine artery which should be either clamped or ligated and cut.

6. Clamp and cut the uterosacral ligaments; make sure that all bleeding vessels are secured. Have an attendant withdraw the gauze from the vagina. Place a pair of large angular forceps upon either side of the vagina below the cervix and sever it below them. The surfaces are thus protected from being soiled or contaminated from the cervix and the removal of a good portion of the vagina ensured.

7. The clamped vessels are ligated with chromic catgut ligature, exercising care not to include nor pinch the ureter.

8. Extend the peritoneal incisions to permit the inspection and removal of enlarged lymphatic glands from the bifurcation of the aorta to the obturator foramen. Secure all bleeding vessels. Pack the surface above the vagina loosely with iodoform gauze and stitch the peritoneal

surfaces over it with continuous chromic catgut sutures, inverting all ligated stumps into the vagina.

9. Remove all gauze pads, cleanse the pelvis, and close the abdominal wound in such a manner as to retain analogous structures in apposition. (§ 148.) Cleanse, and apply dressing. Where the conditions make it desirable, after stripping back the anterior peritoneum and bladder the broad ligament can be spread out, the uterine artery traced outward and ligated near its source, the ureters raised, held to one side by traction ligatures, and a much larger portion of the parametrium removed. Where the ends of the ureters are imbedded in carcinomatous material, it may be necessary to resect them in order to remove all the affected tissue, when they should be re-inserted into the bladder.

The gauze inserted in the pelvis is withdrawn through the vagina in four to six days.

In Freund's first procedure the broad ligaments were ligated external to the appendages, a second ligature was placed on the portion of the broad ligament which included the round ligament, and a third secured the base of the broad ligament by being introduced from the vagina through a trocar needle which Freund devised for the purpose. The last ligature was tied upon the base of the ligament as firmly as possible. In this way three ligatures were inserted, one under another. The other broad ligament was secured in the same manner. The peritoneum above the bladder fundus was cut transversely upon the anterior uterine wall. A similar section was made upon the posterior wall, somewhat lower, and these wound margins were united with a silk loop after the removal of the uterus. The uterus was separated by knife or scissors. Hemorrhage from small vaginal arteries was controlled by ligation. All the ligatures were carried into the vagina, and by traction the stump was drawn down. This dragging made the peritoneum of the bladder approach that of the posterior wall of the pouch of Douglas. These two walls could be united by continuous catgut suture. A most careful toilet of the peritoneum was accomplished, the eventrated intestines were returned, and the belly wound closed with sutures. The sutures that were pushed into the vagina could be removed by traction at the end of three weeks. The greatest danger of the operation was infection of the peritoneal cavity.

This operation has undergone many modifications. Credé proposed to resect a part of the anterior pelvic wall several days before the operation, but found no imitators. A. Martin made a moon-shaped abdominal incision from the one anterior superior spine to the other, by which he hoped to be able to keep the intestines better in the abdominal cavity. He has not continued the procedure. The separation of the bladder from the uterus prior to the introduction of the base sutures has been a great improvement, decreasing the danger of injury of the bladder and of ligation of the ureters. Kuhn raised the uterus by means of a colpeurynter in the vagina, and made it more accessible. Eastman accomplished the same thing by a grooved staff through the posterior vaginal fornix. Bardenheuer advocates leaving open the peritoneal wound for drainage, but his results were not such as to make the plan acceptable.

A modification of the operation is to make an incision through the vagina around the cervix; pack the cavity with iodoform gauze and complete the operation from above. Another is: to separate the front and back, open into the vagina, and complete the operation by the application of clamps to the broad ligament. Veit operated by ligating and cutting the broad ligaments as far as the vault of the vagina; then he completed the operation through the vagina. Gubarroff, of Moscow, advocates the abdominal procedure because of the impossibility of the removal of lymph-glands and the tissue at the base of the broad ligament in vaginal total extirpation.

In marked involvement of the cervix Rumpf proceeded by the following plan: He ligated the broad ligament above, opened the parametrial connective tissue, and proceeded to expose each ureter in its entire course from the psoas muscle to the bladder; thereby the uterine arteries were severed and ligated, and the parametrial tissue could be removed bluntly nearly to the uterus without incidental bleeding. Subsequently the anterior leaflet of the broad ligament was cut through, the peritoneum over the surface of the bladder divided transversely, and the latter bluntly separated from the cervix. The parametrial tissue beneath the ureter could be removed still further. The vagina was separated by means of a Paquelin cautery, after the removal of the uterus, was filled with iodoform gauze, and the peritoneum was closed over the rest of the broad ligament. Rumpf reports a case operated upon in this manner which remained free from relapse for over two years. Clark and Kelly effected the same purpose by introducing fine bougies into the ureters to render them perceptible.

Ries advocates the removal of the lymphatic glands on account of their being the source from which redevelopment occurs. He operates in the following manner:

1. Through the vagina he amputates the portio vaginalis and tampons with iodoform gauze.

2. Through the abdominal incision from the symphysis to the umbilicus he ligates the ovarian artery in the infundibulopelvic ligament near the pelvic wall, and splits the peritoneum over the common iliac, exposes the vessel by blunt and sharp dissection until the bifurcation is exposed, when the ureter is separated as far as the bladder.

3. The broad ligament is ligated toward the pelvis in sections and the part toward the uterus is secured with clamps. The bladder is separated bluntly from the surrounding broad ligament and the uterine artery tied peripherally.

4. The collected fat tissue with the glands is removed from between the large vessels, the external and internal iliac.

5. The vagina is opened, the uterus removed, and the vaginal canal filled with iodoform gauze, while the peritoneal flaps are united with continuous silk suture and the belly cavity completely closed.

When infection is so great as to require such an extensive separation, the marked danger from sepsis and from relapse of the disease renders the operation of questionable value. Werder, of Pittsburg, in order to lessen the danger of wound reinfection, advocated an abdominal hysterectomy in which, after ligation of the broad ligaments, the bladder is pushed off not only from the anterior surface of the uterus, but from the anterior portion of the vagina for one-third to one-half its length. The tissues also are separated from the vagina posteriorly and laterally, the abdominal wound is closed by a previously introduced suture or hooked forceps; the uterus then is drawn through the vaginal outlet and the remaining portion of the operation completed by the vulva, which saves the wound from contact with the infected portion.

In order to control hemorrhage in an extensive dissection of the pelvic structures, Polk advocated ligation of the anterior trunk of the internal iliac artery. (Fig. 538.) The distribution of vessels from these trunks is, however, somewhat irregular, the vessel itself is short, and the structures supplied by the posterior trunk are so bountifully nourished by anastomotic vessels that I have tied one or both the internal iliac vessels, which permitted a most extensive dissection free from bleeding. In all of these cases the involvement of structures was so extensive that the operation was of doubtful utility. The first patient survived the operation and returned home, but soon perished from a recurrence, the second case developed tetanus at the end of ten days after the operation, and died.

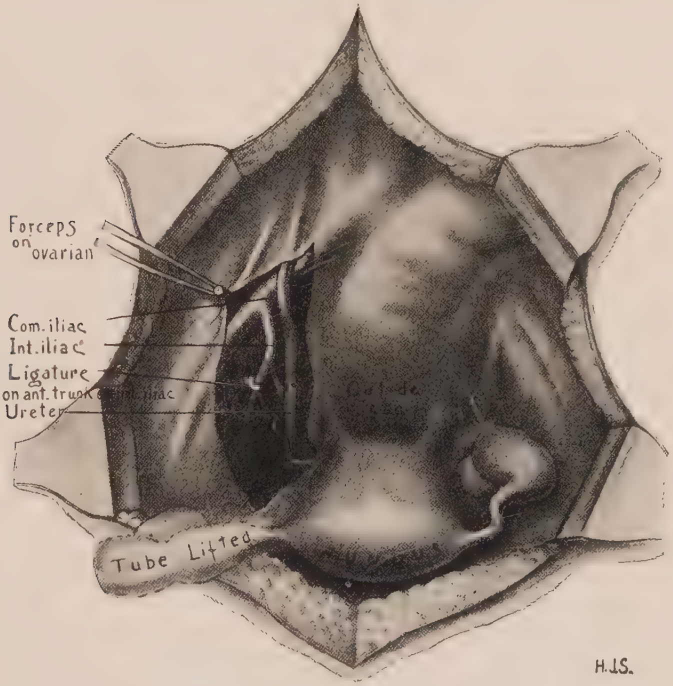


FIG. 538.—Ligation of the Anterior Trunk of the Internal Iliac.

Schröder, after ligation of the infundibulopelvic ligaments and the portion of the broad ligaments containing the uterine arteries, amputated the fundus at about the level of the internal os. After bleeding vessels had been secured and the stump dissected out, the vaginal surfaces were united, over which the peritoneal flaps were sutured. The operation is objectionable because of the danger of reimplantation. Mackenrodt urges not only the removal of the glands of the pelvis, but also an extensive removal of the parametric tissue, since in the latter metastatic nests were most frequently found, which were the chief cause of recurrence. In order to accomplish this most effectively, he advocates the following procedure:

1. A large crescentic abdominal incision from one iliac spine to the symphysis and upward to the opposite is made, through which insertions of the recti muscles are divided without opening the peritoneum, and the abdominal muscles are separated from the pelvic attachments.

2. The peritoneum is pushed off to its reflection over the anterior wall of the bladder, when it is cut through and pushed behind the uterus.

3. The uterus is drawn out and the ovarian arteries ligated in the usual manner. The peritoneum is then sutured behind the uterus from the right side of the pelvis across to the left, covering the sigmoid flexure, which permits the subsequent steps to be extraperitoneal.

4. The pelvic peritoneum is dissected up as high as the iliac vessels, where the glands are found and removed with fat and connective tissue. During this stage the ureters are carefully protected.

5. The bladder and rectum are separated, the entire vagina freed.

6. The broad ligaments and paravaginal tissues dissected out, the vagina clamped and divided with cautery below the clamps.

7. The space between the bladder and the abdominal wall is drained through the lower angle of the external wound. The divided recti are united by silver wire sutures and the abdominal wound closed. Usually considerable suppuration is expected between the bladder and the rectum. In none of the cases thus treated has the absence of recurrence been sufficiently long to make the performance of so extensive an operation seem justifiable.

Wertheim, Krönig, Kundrat, and von Rosthorn are earnest in their advocacy of the removal of the parametrium and lymph-glands in all cases of carcinoma. While I would agree with them as to the importance of getting well beyond the disease, in the removal of a large portion of the parametrium and of the vagina, my experience leads me to believe that the attempt to remove the glands is of little avail, as it is impossible for the most skilful surgeon to remove all the glands, and the investigations of Schauta seem to indicate that the inaccessible lumbar glands are frequently infected before those in close relation with the uterus. Fortunately, the involvement of glands does not always indicate that these structures will be the cause of recurrence when the original source of the disease has been removed. In the great majority of the cases coming under my observation recurrence has followed in the vagina and cicatrix rather than in the pelvic glands. When the increased mortality incident to the prolonged operation, the tedious convalescence, the aggravated suffering from ureteral and vesical complications are considered, it becomes a serious question whether anything is gained by the extensive and more thorough procedure. Wertheim, the apostle of this procedure, had an immediate mortality of 12 in the first thirty cases, 5 in the second, and 3 in the third series of thirty. Even the latter, which equals 10 per cent., is a much larger mortality than men of equal experience usually have in ordinary hysterectomy.

Comparative Advantages of the Two Proceedings. The principal danger of the abdominal procedure arises from septic infection. The investigations of Menge and others have demonstrated the presence of pyogenic germs in the discharges of uterine cancer. The much longer duration of the operation, the increased exposure to infection, and the lessened powers of resistance favor its development. In the vaginal procedure the peritoneum is less exposed to infection, and the operation can proceed without any, or with scarcely any, soiling of the peritoneal cavity. In our present methods of procedure the operation is more expeditious; with the separation of the bladder from the cervix and the broad ligament the uterine artery can be ligated without danger to the ureter.

If the abdominal procedure afforded no greater advantage than the extirpation of the lymphatic glands it would be of little significance when it is remembered that the glands are rarely involved until late in the disease; and when the disease has extended to the lymphatic glands of the pelvis, the operation is little better than a mutilation, for it will scarcely have any influence upon the subsequent progress of the disease.

Notwithstanding the vaginal operation can be done much more expeditiously and with less danger to the patient, with less discomfort during the convalescence, it cannot be denied that in cancer of the uterus, where the disease is confined to that organ, the abdominal operation should be preferred. This preference is granted it not because it permits us to extirpate the lymphatic glands—for I believe that no operator is sufficiently skilled to make sure that all the lymphatic glands are removed, and even if they were, the extensive lymphatic system would still afford opportunities for the retention of infection—but because it enables the operator to remove a larger amount of parametrial tissue with greater safety. The large number of cases in which vaginal hysterectomy has resulted favorably, the fact that where recurrence takes place it is in the cicatrix, in the vaginal wall, or in the parametric tissue, leads me to believe that the assertion regarding the infrequency or lateness of lymphatic gland infection is correct, and that where the disease has resulted in the involvement of the glands, no operation affords much hope of cure. In cases in which it is evident that the disease has extended outside the uterus and the operation is done for its palliative effect, removing only the infected tissue, the abdominal procedure should be preferred, as it enables the ureters and bladder to be kept under observation better.

A narrow contracted vagina, a large or fixed uterus, extensive involvement and destruction of the cervical walls, which afford no firm tissue to be seized, and more or less fixation of the uterus from inflammatory lesions, render the vaginal procedure very difficult. Complications of the diseased uterus with abdominal growths, such as myoma, ovarian tumors, and extra-uterine pregnancy, should be attacked through the abdomen. When we come to the duration of after-results, the advantage seems to favor the abdominal procedure.

Injuries of the ureters occur less frequently by the abdominal route, but in all cases of extensive involvement of the parametrium, the operator should ascertain the position of the ureter by following it down from above before blindly applying a ligature. Through neglect of this precaution I have thrice ligated a ureter. In one of these cases the patient had no urine enter the bladder for two days, when I reopened the abdomen to find the ureters severed and tied. They were implanted into the bladder. The patient recovered and lived nearly a year when she succumbed to a recurrence of the cancer. If the ureter is unavoidably or accidentally injured, an attempt may be made to unite it by suture, as was done by von Tauffer and Westermark, or the ureter may be implanted in the bladder.

In extensive parametrial involvement, where the infiltrate surrounds the uterus, I have in several cases purposely cut through one or both ureters, dissected out the involved structure to the pelvic wall, and reinserted the ureter into the bladder at a higher level. In all of these patients the ureter was distended to the size of a finger as a result of compression from the infiltrate. All recovered from the operation, but four succumbed some months later to recurrence of the disease. Küstner, when unable to accomplish a vesical transplantation, formed a vesicovaginal fistula, followed later by a colpocleisis in preference to a nephrectomy. Where the ureter has had to be resected and is too short for reinsertion into the bladder, it may be brought out through the loin on the back, or the pelvis of the kidney may be opened and drained as advised by Watson.

The Sacral Method. Kraske, in 1885, introduced an operative procedure, under the title of the sacral method, for the purpose of extirpating the upper part of the rectum for carcinoma. It consisted in resecting the rectum after the removal of the coccyx and a portion of the sacrum. Hochenegg, in 1888, after a series of brilliant successes, adapted the operation to the treatment of some of the disorders of the female sexual organs, and the following year reported the application of the method to the removal of the uterus. The operation was performed as follows: The patient was placed in the Sims position, with the pelvis slightly elevated, an incision was made from two to three centimeters above the right sacro-iliac synchondrosis to within one centimeter of the left side of the anus. After cutting through the skin and fascia, the under part of the sacrum and the entire coccyx were exposed. Now follows the bone operation. If the coccyx is large and broad, its removal is sufficient; otherwise a portion of the left sacral wing is also resected. If a part of the sacrum is to be removed, we cut through the sacrosciatic ligaments, and with a rongeur cut away the left side of the lower two segments of the sacrum. The prevertebral fascia is split the entire length of the wound; the now free-lying rectum is bluntly separated on the left side and displaced to the right. Later experience demonstrated the advisability of opening upon that side of the rectum on which the parametrium was most infiltrated. The rectum is shoved aside, and Douglas' space opened by a transverse incision, which is recognized as the hardest part of the operation. One or two fingers are introduced into the opening, the uterus and its appendages are explored, and the practicability of their removal is determined.

In removal of the uterus it is seized and drawn through the incision of Douglas' space into a position of strong retroflexion. The broad ligaments upon both sides are cut between double ligatures; when the uterus becomes so movable that it can be drawn further down, its anterior surface is inspected. The peritoneum above the vesico-uterine reflexion is cut transversely, and, together with the bladder, pushed downward. The uterine arteries are generally ligated under the eye, and the ureters easily pushed aside, although they have been injured. After the separation of the lateral appendages the organ remains in union only with the vagina. A transverse incision through the peritoneum in front of the uterus is made. This is separated and sewed to the peritoneum of the anterior wall of the rectum. The vagina is closed in two stages. Iodo-

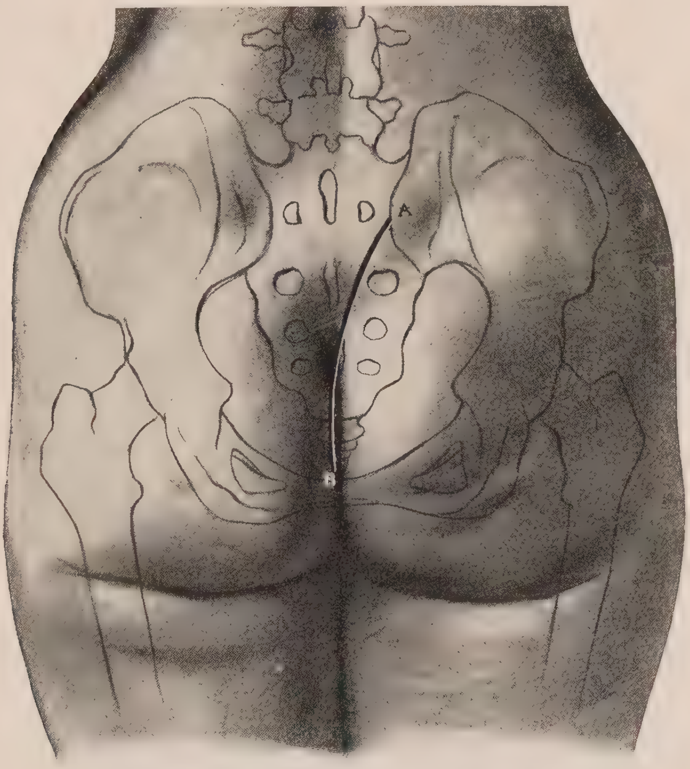


FIG. 539.—Skin Incision for Sacral Resection.

form gauze is packed about the remaining portion of the wound and brought out at the center of the posterior wound, both ends of which have been closed. This operation was extended by Herzfeld, who found that, in the majority of cases, only the removal of the coccyx was required. He penetrated the structures to the right side of the rectum, for the reason that the vagina is situated more to the right, is more accessible, and there is less interference with the rectum. The transverse opening is made in Douglas' space, the right and left broad ligaments are tied and cut, after which follows a complete closure of the peritoneum before further extirpation. There is no possibility of soiling the peritoneal cavity by contact with cancer. The rectal peritoneal surface is sewed to that of the bladder, and the stumps are fastened in the wound laterally, making them extraperitoneal. Hegar cut transversely in the anterior uterine wall above the bladder fundus, and shoved back the bladder and ureters. The subsequent removal of the uterus is similar to that described in Hochenegg and Herzfeld's operation. Schede protests earnestly against sacrificing the sacrum. In a large series of operations he never found it necessary to remove enough of the sacrum to involve the lower sacral

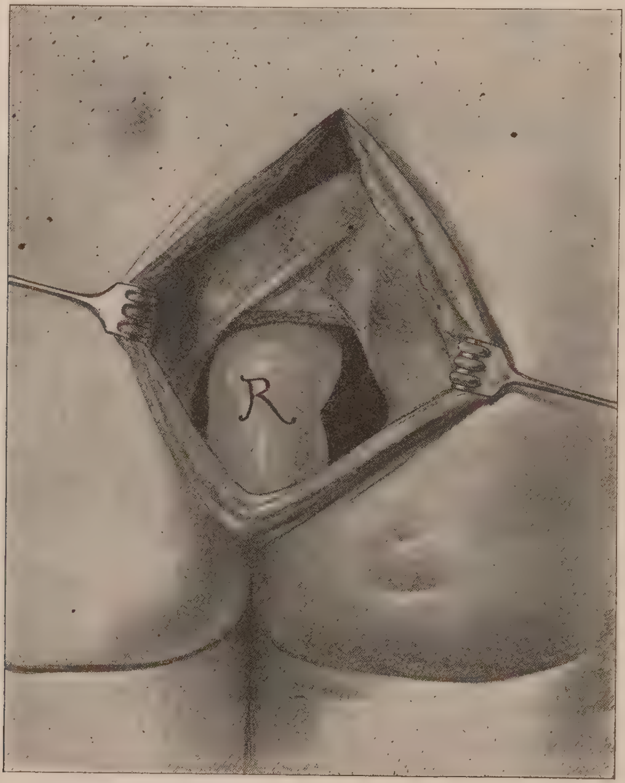


FIG. 540.—Sacrum Resected; Rectum Exposed.

foramen and its nerve. He designates the removal of the lower two sacral nerves a crime, as the destruction of these nerves paralyzes the detrusor vesica uterini and causes a very severe inflammation of the bladder, which increases the distress and peril of the patient. Zuckerkandl introduced a still more conservative method, in which there was no bone resection. Skin section was from the left side of the right tuberosity of the ilium until midway between the end of the coccyx and the anus. At the sacral margin it formed a bow bent hard to the right. The gluteus maximus muscle, the sacro-iliac and sacrosciatic ligaments, the musculus coccygeus, and part of the levator ani muscle were cut through at the margin of the sacrum and coccyx. The rectum is set free and the operation proceeds as previously described.

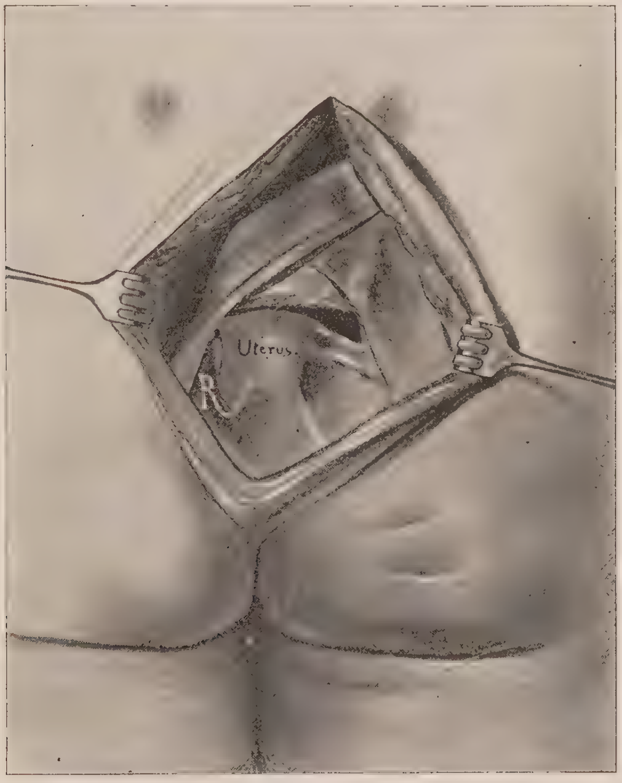


FIG. 541.—Rectum Pushed Aside; Uterus Exposed.

Wolffler places the skin section to the right of the sacrum, over the somewhat narrowed part at the union of the coccyx and sacrum; the section forms an easy curve, with its concavity to the right, and ends near the rectum, in the neighborhood of the vulvar commissure. The gluteus maximus and the levator ani are cut near the rectum, and the deeper structures become accessible. Zuckerkandl designated his and

Wolffler's methods as *parasacral section*. These operations are more bloody, because the sacral, the median, and the inferior hemorrhoidal arteries and the pudendal artery and vein are in the range of the incision. Hegar made an osteoplastic resection of the sacrum and coccyx. A **V**-like incision, with the arms beginning one centimeter beneath each inferior posterior iliac spine, converged to the point of the coccyx. After separation of the soft parts and bands near the sacral margin the rectum was bluntly separated from the anterior sacral surface, a chain-saw was introduced between the third and fourth sacral openings, the sacrum cut transversely through to the posterior periosteum, which was retained, and the sacral part turned up. After the operation this flap was returned to place and secured by sutures. Consolidation usually took place in a very short time. In two cases necrosis resulted, and the flap had to be removed. After the operation the skin wound was closed, with the exception of a small drainage opening, and the advantage of the procedure is that the anatomic relations are exhibited as before. This osteoplastic resection of the sacrum is applicable to the removal of carcinomatous uteri as well as retro-uterine tumors.

Kocher and Heinecke recommend the splitting of the lower sacrum in the middle and the separation of the sides from one another. Levy and Schlange, in opposition to Hegar, turned the flap toward the anus, while Rydygier made the incision in the soft parts on one side, and, after transverse incision, turned the sacrum toward the other side.

Borelius changed this method in the removal of a carcinomatous uterus as follows: He began with the skin section in the middle line, about two centimeters above the sacrococcygeal articulation; then somewhat to the left, approached the point of the coccyx forward, through the rectosciatic fossa, three to four centimeters from the anal aperture; from this point he progressed forward, and again approached the middle line until led to the posterior commissure. After laying free the left border of the coccyx, the sacrococcygeal angle is cut through. The skin section, in its entire length, is sufficiently deepened, and the coccyx, together with the anal portion, is held to the right; after separation of the rectum we can proceed from the posterior vaginal wall to the extirpation of the sexual organs. After the operation the coccyx is replaced and fixed with periosteal sutures.

Various modifications of Hochenegg's procedure for the extirpation of the uterus have been introduced; by proceeding, as Herzfeld suggested, to the right of the rectum, Douglas' space will not be missed. In the search for the space—made easy by having an assistant introduce the finger into the rectum to indicate the plica transversalis recti, as the cup of Douglas' space always lies at the height of this fold—we only need to make the incision to enter the space. The difficulty in finding Douglas' space has occasioned the majority of operators to renounce the primary opening in the peritoneal cavity entirely, and to proceed to the extirpation of the uterus by the opening from the vagina.

Incidentally an easy way of accomplishing the uterine extirpation would be to follow the proceeding of Czerny, who cuts from the vagina about the portio in the same manner and separates the structures as in the vaginal method. After completion of the operation most operators fill out a wound nearly the size of a fist with iodoform gauze and treat it as an open wound, with the exception that the wound in the skin is partly closed, leaving an opening in the center, through which the iodoform gauze is carried out; also, in the osteoplastic resection we cannot well renounce the use of this drain, and iodoform gauze is placed on each side. Steinthal brought the gauze out through the vagina, and thus closed the entire posterior wound. Zweifel, Schauta, and Wertheim have operated in a similar manner with favorable results. One objection to this operation is the long convalescence, requiring fully six weeks for the patient to recover, after which time necrosis of the bone may cause fistulous openings, which may continue for a much longer period. The osteoplastic resection seems to shorten the convalescence. The complete suturing of the sacral wound, with drainage through the vagina, is the most satisfactory procedure. It can be claimed for the procedure

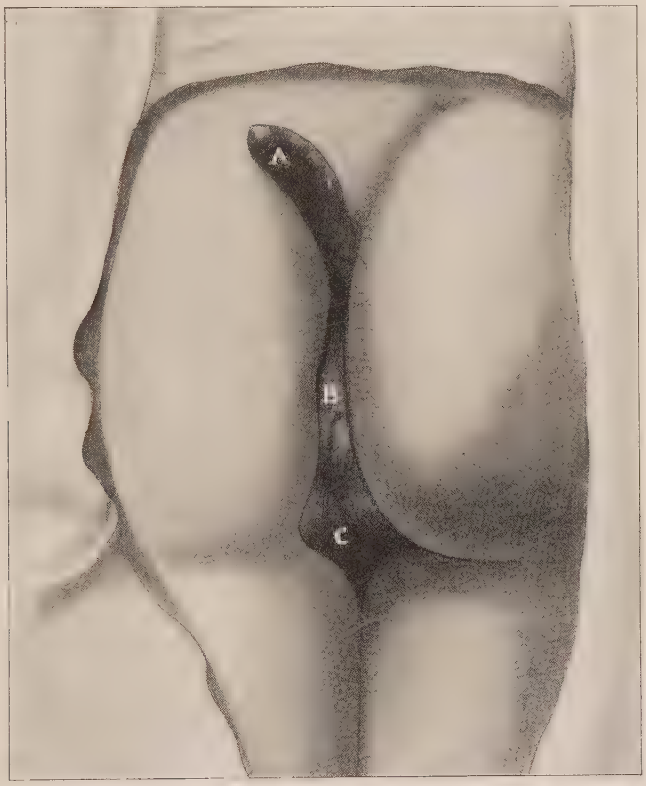


FIG. 542.—Patient From Whom Uterus, Ovaries, Posterior Wall of Vagina, Perineum, and Five Inches of the Rectum Have Been Removed.
A. Artificial anus. B. Anterior wall of Vagina. C. Vulva.

that the entire operation can be accomplished more readily under the eye, and ligation of the uterine arteries is accomplished separately, and not by mass ligature. Injuries of the ureters are easy to avoid. Such injuries, however, do occur.

The operation may be found advisable in cases in which there is reason to suppose that the ureter is embedded in infiltration. In one case Schede resected a piece of the bladder three centimeters long, together with a long piece of the ureter. Von Winckel objects to the operation on the ground that he could not see the ureters. Hochenegg reported ninety-eight, with eighteen fatal cases—eight of sepsis or pelvic phlegmon. The loss of blood is much greater than in the vaginal operation. In the course of the after-treatment life may be endangered by bursting of the peritoneal wound. Hochenegg points out that, by reason of the sacral method, a large series of cases of carcinomata of the bladder are reported; the ureter and parametrium have become more or less involved and increase the technical difficulties that complicate the operation. I have removed the uterus, ovaries, and tubes by sacral resection in one case without injuring the rectum, and in two with resection of the rectum. All these recovered. In one of the latter the operation consisted in the removal of five inches of the rectum, the uterus, ovaries, and tubes, the posterior wall of the vagina, and the perineum. The rectum was stitched to the skin over the sacrum and to the anterior wall of the vagina. This operation was performed for epithelioma involving the rectum, extending to the perineal margin around the anus, and in the parametrial tissue behind the uterus. The patient had previously undergone a Maydl colostomy. After the recovery of the posterior wound an incision was made around the artificial anus and the two ends of the bowel were raised and reunited, after which all fecal discharges took place through the sacral anus. Thirteen months after the operation the patient returned to her home in Ireland, since which time no knowledge has been obtained of her progress.

The Perineal Method. Zuckerkandl, in the year 1889, presented a method for extirpation of the uterus by an opening between the vagina and rectum. With the patient in the lithotomy position, the intestine was raised toward the sacrum with a ╱‾‾╲-shaped flap incision, whose nearly seven centimeters long transverse portion lies in the half oval line in front of the rectum, and whose angles upon each side extend to the ischial tuberosities. After separation of the skin and superficial fascia, and separation of the skin-flaps from the under layer, the projecting bundle of the external sphincter, which penetrates the labial commissure, is separated and the lower part of the vagina loosened from the rectum. The remaining part of the septum is bluntly dissected until Douglas' fold is reached, when the vagina is opened transversely, the uterus drawn out from behind, and its extirpation occurs as readily as in the sacral method. The peritoneum is closed, and, after removal of the uterus, the ligament stumps can be buried in the peritoneal cavity or placed by sutures extraperitoneally, as in the vaginal method. Frommel seems to be the only one who has found this operation practicable. He holds it advantageous to cut about the vagina, as in the vaginal method, push back the bladder, pack the vagina with iodoform gauze, and then perform the perineal operation. The operation is quite bloody, as the numerous venous plexuses between the vagina and rectum are opened. The operation seems an unnecessary interference with the pelvic floor, as the same increased room will be secured by enlarging the vagina and the danger from infection necessarily must be increased very greatly.

The Mortality of Abdominal and Vaginal Operations. The operative mortality necessarily must be governed by the percentage of carcinomatous cases submitted to operation. The surgeon, who finds but 20 per cent. of his cases operable, accepts less risk than the one who operates 50 or 60 per cent. Thus, in a Berlin clinic, out of 402 carcinoma cases, but 83 were found operable. Wertheim, in his first series, operated but 29 per cent., while in the last, 51 per cent. were operable. The mortality may be influenced also by the character of the operation. The radical procedure, which aims to remove the parametrial tissue and the infected glands, necessarily must be attended with a large mortality. Wertheim had from 10 to 40 per cent. respectively in his last and first series. The mortality may be fixed at 6 to 10 per cent. for abdóminal hysterectomy where ordinary care is exercised to remove the adjacent parametrium without reference to the glands, and from 3 to 5 per cent. for the vaginal procedure.

Duration of Recovery. In the earlier operative work it was considered that if a patient survived the operation two or three years without recurrence, she might be pronounced cured, but further experience has demonstrated that recurrence may take place up to the fifth year. After this lapse of time the probability of permanent recovery is great. There are occasional cases in which recurrence after partial operation has been discovered as late as six, seven, or eight years. It would be a question in these cases, however, whether it might not be considered a condition similar to that which would take place in a woman whose susceptibility to malignant degeneration was great, and that the irritation produced in scar tissue would favor such development and should be considered a primary, rather than a secondary, condition. Frommel, in his investigations, has never seen recurrence follow after four years. In one hundred and eighty-eight cases of cancer of the neck and twenty-six cases of cancer of the body reported by Fritsch, he saw sixty-five free of recurrence at the end of one year, or 58.5 per cent. of the cases in the neck and 69.2 per cent. of those in the body. At the end of two years Olshausen saw one hundred and forty-one, or 44.7 per cent., of the neck, and sixteen, or 81.2 per cent., of the body, free from recurrence; at the end of three years he reported one hundred and twelve or 37.5 per cent., of the neck, and thirteen, or 69.2 per cent., of the body. At the end of four years he found free from recurrence of cancer of the neck eighty-eight, or 29.5 per cent.; of the body, eleven, or 63.6 per cent. From this collection it is evident that in the first and second years after operation the great majority of recurrences appear, and then the number falls off more and more. The duration of life following an operation largely depends upon the stage of advancement of the disease. Leopold is quoted by Williams as having recorded a recurrence of 23.7 per cent. in early cases as contrasted with 66 per cent. in a more advanced stage.

The final results of individual operators, however, are so very different that it is impossible to draw valuable conclusions from them. Thus, Kaltenbach, with his brilliant primary operative results, evidently extends the indications for the operation quite far, and subjects all cases to it in which it seems technically possible. In such a large number of cases there must be a few in whom the new formation has advanced proportionately far, and relapse is not surprising. Leopold, on the other hand, drew the indications very narrowly. Statistics demonstrate that the vaginal operation has given excellent primary results, but, on the other hand, show that, of all the radical operations to which patients are submitted, after a year recurrence has followed in one-half, and in the second year in a still considerable percentage. The gravity of the disease can be appreciated still further when we realize that only a small percentage of the cases which come under the observation of the gynecologist are in a condition to permit of radical operation.

Recurrence. These cases subjected to radical operation when the parametrium without doubt is infiltrated extensively, are not followed immediately by recurrence only, but the fatal termination also is very rapid. Tannen has proved that the duration of life in such recurrence of cancer is briefer than it would have been had the disease been let alone, for eight or nine months of life for patients in whom the disease thus recurs is less than would be secured by such palliative treatment as partial resection or energetic cauterization of the diseased area. Sanger and Thorn have shown that life is lengthened by the latter. Surgeons, from their experience in mammary cancer, are inclined to combat these views, but statistics do not support them. As contra-indications, then, against total extirpation are to be considered great enlargement of the uterus and extensive adhesions, especially with intestine. Those uteri should be excluded from vaginal operation which cannot be removed through the vagina without morcellation. To this class belong carcinomata complicated with myomata. Pregnant and puerperal uteri are proportionately easy to remove by the vagina, in spite of their enlargement, as has been demonstrated by Olshausen, Hofmeier, and others, and the comparative narrowing of the vagina observed in the nullipara and in old women exhibits no contra-indications to the vaginal operation.

The primary operations are so satisfactory that we could scarcely wish them otherwise. Olshausen's one hundred total extirpations with but one death, when some of the patients were already pyemic, are positively brilliant results. Winter describes three forms of recurrence: 1. Local, or recurrence in the wound—a return of the cancer in its primary kind within the compass of the field of operation; 2. lymph-gland recurrence—return of the tumor in any lymph-gland of the body; 3. metastatic recurrence. Dissemination by the blood-vessels leads to the development of the tumor in the more internal organs. The first is produced either by portions of carcinomatous growth overlooked in the operation or fragments that have broken off and lodged in the folds of the wound. These correspond more or less to the neighborhood of the previous operation, which demonstrates the correctness of Thiersch's view, confirmed by Heidenhain's investigation on mammary cancer, that the carcinoma frequently extended itself far over the lateral or immediate limits in small sprigs, and that, after the removal of the new formation, the mass is seen to be separated by healthy tissue from visible sprigs or microscopic cancer-nests that may be the source from which the cancer redevelops.

Our study of the progress of the disease has already illustrated the extension of carcinoma of the vaginal cervix into the vault and parametrial connective tissue. Mackenrodt and Leopold, in their anatomic investigations of extirpated parts of the parametrium, have demonstrated fine, microscopically perceptible sprigs situated in remote parts of the parametrium, and it is quite possible that such fine sprigs may be found outside of the incision as well. It is, consequently, difficult to be certain whether wound relapse occurs from sprigs of cancer growth in the parametrium or from small masses which have been broken off from the diseased tissue and been implanted upon the new wound. Most generally the patient gains in body-weight and improves in appearance after the operation, but individual cases will be found to exhibit pain in the depth of the pelvis at an early period, which radiates from the lower extremities, and frequently becomes very distressing. In its further course there is edematous swelling of the lower extremities, often venous thrombosis; in other cases, bleeding and discharge, which cause the patients to return for investigation.

The diagnosis of carcinoma recurrence usually is confirmed without difficulty if we make a combined investigation from the rectum, with the thumb in the vagina, by which the penetrated parametrium can be fixed between the finger-tips. Hemorrhage sometimes may take place in granulations which are formed about the ligatures, especially if silk has been used. When the appendages have been left, a mass that has a soft sensation may be felt in the vagina. The cause of bleeding upon an exact examination is recognized as the fimbriated end of the tube. I have seen periodical bleeding from the vagina after hysterectomy when an ovary has been left. The absence of infiltration and the impossibility of separating the small tumor masses from a polypus of the vagina contra-indicate carcinoma. In doubtful cases the tissues should be examined with the microscope.

Another form of recurrence is that of which Winter speaks as infection-relapse, in which portions of carcinoma are broken off, come in contact with healthy tissue, lodge there, and develop the original disease. In a single woman upon whom I operated to remove a small uterus through the vagina the operation was attended with considerable difficulty; the fundus uteri was torn open in attempting to bring it down, and some jelly-like material escaped into the peritoneal cavity, which was thoroughly irrigated as soon as the operation was completed. Less than six months later the patient developed a mass upon the side of the pelvis corresponding to that into which this fluid material had escaped, and, upon opening the mass, material similar to that which had escaped from the uterine cavity was found. The disease progressed and eventuated in the death of the patient.

The second form of recurrence is a lymphatic gland recurrence. The investigations of Poirier and Leopold have demonstrated that the lymphatic vessels of the middle and upper thirds of the vagina and those of the cervix proceeded to the iliac glands along the course of the iliac vessels and at the sacro-iliac articulation in the angle formed by the separation of the external and internal iliac vessels. The lymphatic vessels of the uterine body proceed to the upper margin of the broad ligament and follow the spermatic artery to the vertebral column, where they open into the lower lumbar lymphatic glands, which are situated behind the peritoneum in the neighborhood of the large vessels. Fortunately, lymph infection occurs late in cancer of the uterus, so that lymphatic gland recurrence after total extirpation is a rare condition. After chloroform narcosis the roundish, hard, immovable nodules can be recognized in the pelvis.

The third form is that of metastatic recurrence in which the disease is carried to more or less distant organs and presents nodules of a histologic structure similar to that of the primary cancer. These metastases in uterine carcinoma are rare, and exist only in advanced stages.

327. Palliative Operations. Unfortunately, the majority of women suffering from cancer of the uterus come under the observation of the surgeon too late and must be considered incurable. Extirpation of the uterus does not make the prognosis more favorable when the disease is widely extended. As much can be done through palliation and symptomatic therapeusis, which necessarily is an important part of the treatment. The treatment of this large division has failed to receive the consideration given to the curable class, but its value must not be considered trifling. It comprises not only the study of the means which will afford the patient temporary relief, but also those which will diminish her suffering and occasionally afford her a ray of hope. The great variety of methods advocated betokens the weakness of all efforts to oppose the ravages of the fearful disease.

The principal indication for treatment in incurable carcinoma of the uterus is to combat such symptoms as hemorrhage, discharge, and pain. Hemorrhage indicates that the new formation of the disease projects into the capillaries and small vessels, the walls of which are formed by the cancer structure, so that the most trifling injury or increased blood pressure results in rupture. The later suppuration results from wandering-in of saprophytes, which causes the structure to break down. The collection of blood and secretion in the vagina affords ready entrance to those germs which cause suppuration. They may invade the surface of the less well-nourished new formation. Hemorrhage and discharge are not always marked symptoms. The disease often makes great progress without these severe symptoms being present. They may be supplanted by a severe seropurulent discharge similar to that which occurs in senile colpitis, while the odor may be almost completely absent. In old women we frequently observe hard, scirrhous forms of cervix cancer, which show but trifling inclination to disintegrate; consequently, discharge and hemorrhage are wanting, and pain is caused by the further progress of the new formation or is exhibited as the only distinct symptom. In such cases narcotics almost exclusively become the sheet anchor.

Cases which require an aggressive treatment are those forms of portio and cervix cancer which are especially characterized by vigorous growth of the new formation. The more rapid the proliferation, the more rapid its transition, and, therefore, the earlier hemorrhage and discharge appear. The most effective method of treating rapidly advancing carcinoma is the removal of the newly formed mass. In the more gradual development of the disease it progresses deeply; its superficial parts perish slowly, often with considerable hemorrhage, loss of fluid as offensive discharge, decreased appetite, and associated therewith weariness. Palliative operative treatment is especially suitable for the cauliflower form of growth in the portio, unless the vaginal walls have been extensively invaded. Results are less promising when, with existing ulceration, is associated very severe infiltration of the pelvic connective tissue surrounding the cervix. Further, when the new formation has already penetrated the vaginal structures, the knife should not be employed to do more than cut away the fungiform growth, because the wall is thin and the infiltration zone often is difficult to recognize. The knife is especially improper in cancer of the cervix when the infiltration has extended to a marked degree into the parametrium. In such cases, the sharp curet should find employment. The operation should be preceded by careful examination under an anesthetic, which is often necessary to determine contra-indications to total extirpation. The investigator should observe the extent to which the new formation projects into the retro-uterine culdesac or upon the bladder wall, for injury to such structures occurs easily, although the rectum rarely is injured.

Approach of the disease to the bladder is best investigated by the introduction of a catheter, by which the bladder is pressed against the palpating finger. The extension to Douglas' pouch is recognized easily by a digital investigation through the rectum. In large carcinomatous collections it is important to ascertain how far the cancer extends beyond the uterus. When the parametrium is invaded, preparation must be made for severe hemorrhage, as cureting can easily injure the large branches of the uterine artery.

Cureting is the principal palliative operation for cancer, but the treatment should not be confined to the use of the curet alone. Such treatment injures previously uninvolved tissue, which becomes a favorable soil for the extension of the disease, and the subsequent progress is more rapid. Cureting should always be followed by an immediate employment of the cautery or by the application of some strong caustic agent which will destroy a large part of the infiltrated zone and reach tissue of a more normal character. The uterus is exposed by a speculum and lateral retractors. In the employment of the cautery the operator should be prepared to protect the vagina and external genitalia with wooden retractors. To avoid too much absorption of light from the depth of the cavity by their dark color, their inner surfaces should be coated with a thin layer of quicksilver. In addition are needed sharp curets, scissors, forceps, needle-holder, and needles, the latter for use in case of fistula, though they are seldom required. We should also have ice-water for irrigation, and sponges or pads or, still better, cotton or gauze pads upon long forceps. Although the use of the curet is not painful, it is advisable for the patient to be under an anesthetic, as the fear of burning would be so great that an effectual application of the hot iron could not be made.

While the patient may not ask the character of the disease, her fears cause her to anticipate the worst, and her confidence in what is being done for her will depend upon the apparent gravity of the disease, and the abatement of the symptoms which follows the procedure permits her to secure new courage. It is well to assure her that we do not expect to remove the discharge completely, and that subsequent treatment may be necessary. She is thus saved from utter despair upon the return of the discharge.

The procedure is as follows: The patient, narcotized, is placed upon an operating table and the parts are cleansed as thoroughly as the condition will permit; the new formation is exposed with retractors and as much as possible of the tissue is scraped away with a sharp curet, reaching the firm infiltration zone. In the softer parts of the cancer the hemorrhage is considerable, but becomes less as the infiltration zone is reached, because there the vessels still retain their contractile power. To limit the bleeding, then, it is important to proceed rapidly with the curet. As we proceed, the scraped masses are removed by irrigation with ice-water, or, probably equally effectively, with water at a temperature of 120° F. The irrigation enables us the better to inspect the operative field. The finger must be employed occasionally to judge the progress and the amount of resistance, especially of thin points, particularly in the posterior vaginal vault and over the bladder; to assure ourselves that perforation will not occur, and that the new formation has been sufficiently removed. A smaller curet can be used to remove further tufts in the uterine cavity. Shreds and ragged masses which elude the curet are seized with forceps and cut away with scissors, and the bleeding is controlled by firm pressure with gauze pledgets. A crater-like cavity is formed, which frequently can project into the parametrial tissue. The cavity is further cleansed, and hemorrhage is arrested by the use of the thermocautery. It has been advised that the thermocautery be followed by coating the vaginal walls with vaselin, impregnating the diseased structure with alcohol and igniting it, allowing it to burn for one-half minute to a minute and a half, but it is difficult to confine the injury produced by this procedure to the diseased structure. Where there is a disposition to bleed after the application of the cautery, it may be controlled by injecting with a hypodermic syringe 1 part of a 1:1000 solution of adrenalin chlorid to 4 of distilled water. After the oozing has been controlled, the excavated cavity should be packed with cotton saturated in a 40 per cent. solution of formaldehyde. This agent has a caustic action and is more particularly selective of the malignant infiltrate. The packing must be covered carefully in order to protect the healthy structures from contact with the acrid discharge. In the most favorable cases cicatrization is produced. With cicatrization the cavity shrinks and is much diminished. The action of the Paquelin thermocautery must be prolonged to be most effective. It must be removed frequently, because blood and shreds of tissue rapidly coat it. The removal is also done to permit the tissues to cool, that undue scorching may not occur at undesirable points. When the hemorrhage is quite profuse, it is important to bring the entire cavity at once in contact with the cautery. After the hemorrhage is incidentally controlled, we see, here and there, blood trickling and oozing from small points, which must be resubjected to the cautery until the cavity is lined by a thick, dry eschar. Especial care must be exercised toward the vaginal margin, for bleeding will continue there the longest.

To secure a deep, dry eschar, we use irrigation with ice-water at intervals only in the early part of the treatment; and later withdraw and cool the retractors; or retain them in the vagina and cool with a pad wet with ice-water; or, better still, control the oozing with the injections of adrenalin. Should these precautions be omitted, the vagina will be burned severely in prolonged operations. With the wooden retractors the danger of burning is lessened, but the long use of the cautery will require an occasional cooling of the cavity. The procedure concluded, the cavity should be packed with formalin gauze.

In properly selected and carefully managed cases the danger of the procedure is slight, and it can be accomplished without injury to the bladder or the peritoneum. Injuries to the latter are usually not serious. The hemorrhage may be considerable, though it is generally controlled without difficulty by the methods suggested. A ligature is rarely required, for the cautery is competent to control even arterial bleeding. In the rare cases of inoperable cancer of the uterine body great prudence must be exercised to prevent the cautery from perforating the thin walls. As the finger generally can enter the cavity, the weak places can be recognized and undue pressure against them avoided. The procedure usually is borne with little discomfort. The patient will scarcely complain, unless unfortunately an eschar has been made upon the external genitalia. This is very painful and soon becomes edematous.

After the procedure is completed the vulva should be covered with vaselin, and, in the most trifling external burning, a pad should be applied, which is frequently wet with lead-water and laudanum, or a carbolic-acid solution should be applied to the external genitalia. Slight elevation of temperature is generally noticed after such operations, but they exert no marked influence upon the general condition, and the temperature subsides in a few days.

Parametritis and septic processes are rarely observed. The tampon should remain five or six days. The eschar will be found to have separated partly under trifling suppuration, and the cavity will be more or less diminished. After withdrawal of the tampon the loose-lying tissues are removed carefully. The exercise of force must be avoided, because it causes hemorrhage. The cavity is sponged, and we await the complete separation of the slough. Treatment after the removal of the eschar is directed to securing cicatrization. Olshausen lauds for this purpose tincture of iodin. He uses the stronger solution:

℞. Iodin pur.,	1 part
Rectified spirits,	8 parts.

It is applied by a saturated pledget of cotton, which is pressed lightly against the cervix. The superfluous portion flows back into the bowl of the speculum, from which it may be used over and over. The alcohol is an excellent antiseptic.

The patient should be advised to wear a napkin after the application to protect the clothing. The applications are made every two or three days until the cavity contracts and becomes clean. In favorable cases a watery discharge follows. Sometimes it is tinged with blood. It has entirely lost its offensive odor and is so slight that the patient considers herself cured. Torggler tampons the vagina with iodoform gauze saturated with peroxid of hydrogen and permits it to remain for three or four days. The surface is scraped with the sharp curet, subjected to the thermocautery, and covered for a few minutes with cotton soaked with a 40 per cent. solution of formaldehyde. Six to ten days later a slough is thrown off, which leaves a dry wound.

Caustics. Sims followed the use of the curet by an application of zinc chlorid solution. Hemorrhage was controlled by absorbent cotton pledgets, wet with a solution of persulphate of iron, which were removed and followed by others wet with the zinc solution. Van de Warker used a 50 per cent. solution of the chlorid of zinc. After the use of the curet small pledgets, squeezed from a 50 per cent. solution of zinc chlorid, are placed against the diseased surfaces. The healthy tissues are previously protected from injury by an ointment of bicarbonate of soda in vaselin. These medicated pledgets are so placed as to come in contact with the entire diseased surface; a piece of dry absorbent cotton or gauze is laid over them, after which the vagina is filled with a wad of cotton wet with a saturated solution of bicarbonate of soda.

The carbonate causes a decomposition of the zinc salt, which renders it less irritating to the tissues. The nurse should wear rubber gloves to prepare the pledgets. Without these precautions the vagina, and especially the introitus, would be badly burned; indeed, in spite of every precaution the canal frequently is injured seriously. Where the wall is thin, as over the bladder, the weaker solution (ʒvj to f℥j) employed by Sims should be substituted. Sims left the tampons undisturbed for four or five days, unless earlier removal was indicated by elevation of temperature. He ascribed to the agent no especial influence upon the cancer beyond its active destructive effect, but Van de Warker believed the drug to have a special affinity for the cancer tissue, selecting it and leaving the healthy tissue. The microscopic investigations of Ehler upon this subject, however, demonstrate the contrary—that the cancerous tissue is affected only superficially, while necrosis of the healthy tissue extends to a considerable depth. Fränkel employs the zinc salt, but previously scorches the surface with the thermocautery. He leaves the pledgets in contact with the affected surface for twenty-four hours. Great care must be exercised in the cases for which this treatment is employed. Should the bladder or posterior vaginal wall be infiltrated, or if these parts are protected insufficiently, fistulæ may form, which greatly aggravate the subsequent condition of the patient. A slough resulting from the application may open the bladder, rectum, or peritoneal cavity. During or following the separation of the slough, a hemorrhage so severe as to cause a fatal result may readily occur. When the slough has separated, exuberant granulations develop, and later strong cicatricial contraction and shrinking, which Fritsch indicated as the cause of extraordinarily severe pain, which is aggravated by the increased infiltration above the scar tissue.

Ricard relates the history of a patient in whom hematometra and hematosalpinx followed the introduction of zinc chlorid pencils into the uterus. The scar tissue was so dense that the collection could not be reached per vaginam, and the woman perished from hemorrhage after laparotomy. The cervix and the greater part of the uterus had degenerated in cancer. Many patients in whom this treatment has been employed have been so much improved as to justify fully its practice in similar cases, but strong solutions and the paste should be interdicted absolutely.

Fraipont advocates the use of liquor ferri sesqui chloridi, from which he obtained excellent results. This agent has a superficial action upon the surfaces to which it is applied, and forms a slough, following the discharge of which hemorrhage is likely to recur. The bleeding following the curetment can be controlled only incompletely by pressure with an iron solution. A better application is a tampon of iron chlorid. Cotton is saturated with this substance and packed against the surface. These pledgets of cotton form hard lumps, which are difficult to move, and are separated slowly only under strong suppuration or discharge. An early attempt at their removal is attended with severe pain and hemorrhage.

Leopold advocates the use of a concentrated carbolic acid treatment which he continues from one to two months. After radical scraping and scorching with Paquelin's cautery he follows it by cureting the surface every three months and plunging the cautery into the new-growths so that the tissue is rapidly scorched. Chrobak used, after cureting, repeated cauterization with nitric acid. Out of sixty-five cases so treated, he attained good duration results. In one of these cases, after radical sloughing of the carcinoma of the cervix three years and nine months later, because of the strong scar tissue, there had formed a hematometra which was emptied twice. In other cases after repeated cureting and cauterization strong scar formation was seen at the end of three years without recurrence. The third patient was still alive five years after operation, free from recurrence.

This treatment does not seem to have stood the test of time, and now is scarcely considered. Goodell advocated in incurable cancer the use of applications of powdered pepsin and salicylic acid—pepsin to digest and eat off the diseased tissues, salicylic acid to prevent decomposition. Cucca and Ungara advocate tampons wet with:

℞. Methyl-blue,	gr. xc.	
Alcohol (95 per cent.).		
Glycerin,	āā f℥iij.	
Water,	f℥vij.	M.

Apply to the diseased surface.

It arrests hemorrhage, aborts discharge, and prolongs life.

Gellhorn lauds the employment of acetone for producing such a hardening of the cancer tissues as to arrest the disagreeable odor and delay the progress of the disease. He first thoroughly curets the ulcerating surface. The crater of the cureted cavity is dried with cotton sponges and from one-half to an ounce of acetone is poured through a Ferguson's speculum, while the patient is in the Trendelenberg position, which she retains for from fifteen to thirty minutes. The fluid is allowed to run out and the cavity is packed with a narrow strip of gauze soaked with acetone. The healthy surfaces are cleansed and a cotton tampon inserted to absorb the excess. Subsequent applications are made two or three times a week. For these applications it will be unnecessary to administer an anesthetic. It is important to coat the vagina and vulva with vaselin to avoid contact of the fluid with the healthy surfaces. The effect of the remedy is to check oozing, alleviate the disagreeable odor, lessen and cause the discharge ultimately to disappear, and with it the offensive odor.

Parenchymatous Injections. Various agents have been employed as injections into the structure of the cancer with a view to moderating its course or destroying it. Thiersch used nitrate of silver; Schramm, chlorid of sodium and sublimate. Mosetig-Moorhof and Stilling employed pyoktanin. Schultze has lately used injections of absolute alcohol in a large series of cases. Bernhardt employed a 6 per cent. solution of salicylic acid in 60 per cent. alcohol. Vulliet, independently of Schultze, has practised the treatment with absolute alcohol. Under this treatment the bleeding and discharge were trifling or ceased entirely. After ten or fifteen injections the evil smell of the discharge disappeared and the pain ceased. Treatment, in the beginning, should occur at intervals of a few days. During the intervals the vagina may be tamponed with iodoform gauze. In the course of weeks or months the ulcer heals and the infiltrate disappears. Schultze suggests that when the injection is in the neighborhood of the peritoneum, the after-treatment is painful. Schramm found the injections painful and without special influence. The treatment has to be continued over weeks and months—a requirement that can be carried out only in rare cases. Without question, better results will be obtained by the use of the curet and the thermocautery.

A. Martin, in incurable cases, advocates suturing the wound surface occasioned by the curetment. The carcinomatous masses are removed with the sharp spoon and the parametrium is ligated; then, drawing down the uterine stump, strong curved needles are passed under the entire wound surface to the border of the neck or to the mucous membrane, and the thread is so secured that it brings together the wound surfaces created by the curetment. In an extensive wound the entire pelvic body is protected by a mattress suture, when the mobility of the stump is so limited that it is impossible to accomplish the partial sewing of the wound surface. The vagina is so sutured in the depth of the crater that a continuous series of firm sutures come to lie about the opening. However, the operation frequently is impracticable, because extensive cavities with strong infiltrated walls are involved. The advantages offered by the method are that hemorrhage is controlled securely and that after-hemorrhages do not appear. The patient is spared the suppuration which follows the caustic, and a firm scar is formed. Houzel and Chrobak have seen good results from suturing. The method, however, is applicable only to a limited number of cases, and frequently offers great technical difficulties. Sutures often will cut through the carcinomatous tissue; sometimes the wound surfaces break apart, and suppuration again follows. The reported good results are less from the suture of the wound surface than from the union with the parametrium.

A class of cases will be found in which the disease is so extensive that no palliative operation will afford relief, but the physician endeavors to make the patient comfortable and must relieve the distressing symptoms. These are hemorrhage and profuse offensive discharge. The latter becomes so disgusting as to be distressing to the patient and to those about her. Local treatment is demanded. Syringing and tamponade with wet or dry dressings come under consideration. The control of hemorrhage is accomplished more effectually by the tamponade than by syringing with astringents. Kehrer employed the tampon with cotton gauze saturated in an 8 to 10 per cent. solution of acetic alum. Iodoform gauze also exercises a good influence upon the smell of the discharge, but through long employment the odor of the idoform becomes persistent and annoying.

The dry treatment, introduced by Sänger and employed by Fritsch, often proves beneficial, though it requires medicinal help in order to carry it out. It may be employed alternately with injections. The dry treatment follows curetment and cauterization. Iodoform is blown into the vagina, which is then firmly tamponed with iodoform gauze. Tamponades covered with iodoform may be introduced, and may remain as long as possible. This treatment should be repeated once or twice a week for some time. It controls hemorrhage, but especially keeps down the unpleasant smell of the discharge. The unpleasant odor of the iodoform and the existing danger of intoxication have led to the substitution of tannin and boric acid and salicylic acid for similar purposes. Torggler employed charcoal powder with iodoform, which deodorized the mixture; the ulcerated surfaces were rapidly cleaned. Long-continued sitz-baths often have a beneficial influence and afford the patient great relief. When penetration of the bladder occurs, the patient may keep herself comparatively comfortable by wearing a urinal.

Fredric Gwyer has advised the use of powdered thymus gland in doses of ʒi–iii three times daily. This powder, however, is so disagreeable in smell and taste as to make it so difficult to take that a watery extract can be made more palatable. It is claimed that the drug lessens pain, arrests growth, decreases hemorrhage and discharge, and improves the general nutrition. In the few cases in which I have used it, the drug seemed to justify the claims made for it. I have seen wonderful results from the use of the Röntgen ray treatment in superficial and metastatic deposits, but have never been able to see improvement where the disease was confined to the depths of the pelvis.

It is important that the patient should be kept out of bed as long as her strength will permit. When once she becomes bedridden her condition is made worse, and the psychic depression is more marked. It requires the greatest cleanliness and most continuous care upon the part of the nurse to limit the occurrence of bed-sores, as the continuous and abundant discharge keeps the parts wet, and in emaciated persons with feeble powers of resistance the skin becomes broken and extensive bed-sores follow. In these enfeebled patients it is not to be expected that the loss of substance will be recovered, and scarcely that the wound surface can be kept clean. By the processes of absorption from the wound surface and the breaking down cancer, the patient soon has an elevation of temperature which aggravates the discharge. It is not worth while to give antipyretics to break down the temperature elevation in these cases as they have but a trifling influence and soon arrest nutritive processes. A local application of equal parts of salol and aristol has been employed with advantage. When the patient is unable to be under medical treatment continuously, resort must be had to irrigation. The entire series of antiseptic measures have been used; injections of permanganate of potash, one to two teaspoonfuls of 5 per cent. solution in a gallon of water, is one of the best. The drug is cheap, and possesses the advantage that the patient is using a substance that does not irritate nor burn, is completely odorless, and is an excellent disinfecting fluid. It has the advantage over the phenols that the peculiar smell of the latter, mixed with that of the cancer discharge, soon annoys the patient. Martin recommended for a deodorizing injection a solution of 3 per cent. hydrogen peroxid with 1 per cent. thymol. Various astringent fluids, as pyroligneous acid and alum solution, are favored.

If penetration of the bladder and rectum has resulted already, the patient is in a condition which makes it impossible to render her comfortable. Tampons saturated with fatty or oily mixtures, such as bismuth salve, can be employed. The discharge sometimes is held back thus, but the continued irritation of the parts results in an excoriation eczema of the external genitalia, which is a new source of torment for the unfortunate patient. In such cases the removal of the disagreeable odor is no longer possible. In patients suffering from edematous external genitalia covered with excoriations and ulcers, and from already existing edema in the lower extremities, irrigation is very difficult, and is practicable only under increase of pain. Covering the lower extremities with a rubber skirt, by which the odor is prevented from rising, has been advocated, but the moist warmth thus engendered soon renders it unbearable. Fritsch advocates completely covering the vulva and the inner surface of the thighs with frequently changed pads wet with chlorin water, and thus destroy as much as possible the offensive odor.

As these patients may continue to live in this uncomfortable condition for a long period, it would seem to me justifiable to avoid the fecal and urinary discharges by an artificial anus and draining of the pelves of the kidneys. To prevent the admixture of these discharges enables the patient to be less repellent. When the disease is far advanced, unless the measures suggested have been employed, neither the greatest cleanliness nor the admission of fresh air to the sickroom is sufficient to drive out this horrible odor, and the patient becomes a source of discomfort to herself and to those who attend her. Anorexia makes itself noticeable early. This undoubtedly is due to the influence of the sickening odor upon the appetite. Every form of food becomes absolutely repugnant, and the patient is obliged to confine herself then to the smallest quantities of liquid nourishment. Sometimes these are taken more readily when cold. Patients frequently live for a remarkable length of time with scarcely any nourishment. The relief occasioned by the removal of the odor usually results in the improvement of the appetite. Obstinate constipation becomes a marked symptom, which also acts unfavorably on the appetite. When evacuation occurs, it is so extraordinarily painful, because of the hard infiltration in the pelvis, that the patients are constrained to avoid defecation in order to escape the pain. Large enemas are better than purgatives in such cases. An enema of one-half to one pint of kerosene will frequently have a salutary effect in emptying the bowel. Of course, if a rectal fistula exists, the enema will not be practicable. The uncontrollable vomiting which marks the advent of a uremic condition is an exceedingly distressing symptom. Occasionally, the administration of diuretics will relieve it. The condition of the urinary secretion should be observed. Any failure should be an indication to administer diuretics, by which the appearance of vomiting can be prevented.

In the later stages the third distressing symptom is pain, which can be avoided only by the free use of narcotics. The only hesitation in the administration of narcotics should be to avoid their too lavish use early. The patient who becomes accustomed to large doses of the narcotics, may reach a stage at which they are needed still more seriously. She then will have become so inured to the drug that she can no longer find relief. Early in the disease it is better to employ remedies which will give a slight anodyne effect in place of the narcotics. Antipyrin has been found effective. In extensive infiltration involving the lateral and posterior parts of the pelvis this remedy is useless. Such cases are relieved by rectal suppositories containing:

℞. Morphin sulph.,	gr. 1/8
Pulv. opii pur.,	gr. 1/4
Pulv. belladon.,	gr. 1/3
Ol. theobrom.,	ad gr. xx.

Ft. supposit.

Such a suppository, given at night, relieves the distress, secures sleep, and delays the need for larger doses of morphin. An additional advantage is that by such a combination we can increase the dose and give the patient the prescribed daily ration which she will require. Codein may be given in pill form. In the later stages of the disease only the subcutaneous use of morphin in increasing doses will afford relief. Fortunately for the patient and her relatives, toward the end of the disease the compression and obstruction of the ureters occasionally cause sufficient uremia to obtund the general sensibility and lessen the discomfort. The soporose and comatose conditions are frequent, and increase the comfort of the patient. Cumston's proposition to relieve the obstruction by establishing a ureteral fistula or performing a nephrotomy should receive no consideration, as the inevitable fatal conclusion is better early than later, and to prolong life is but to prolong suffering. In advanced stages Drszewczky claims benefit from an ointment of extract of condurango and vaselin.

328. Pregnancy Complicating Carcinoma. We have already spoken of the occurrence of pregnancy as a complication of carcinoma—a complication which is fraught with the greatest danger to two lives. It was stated that the treatment would entirely depend upon the progress of the disease. Thus, if the disease was incurable, and there was no possible chance for the mother, every effort should be made to prolong the pregnancy to full term or to viability of the child, in order that it should have a chance for its life; when, however, the disease is operable and there is hope for a radical cure of the patient, no consideration for the child should operate against the mother's chances. The continuation of the pregnancy is doubtful, and attended with improbability of the child being delivered alive. Danger to the mother is greatly increased, with almost the certainty that the progress of the disease will be so rapid that at the termination of pregnancy the time for radical treatment will be found to be past. Under such circumstances the proper consideration is the life of the mother. If the pregnancy has not reached the fourth month, we may proceed to the removal of the uterus per vaginam. Emptying the uterus reduces its size and renders easier its subsequent removal through the vagina. During and after the fourth month the operation should be performed through the abdomen. Between the fifth and seventh months we may be governed by the condition as to whether we wait for viability or proceed to immediate operation. If the disease is apparently progressing rapidly, an operation should be done immediately, without regard to the child. We may resort to an abortion, and then operate through the vagina, or the abdomen may be opened. In advanced pregnancy Martin has advocated the supravaginal amputation of the uterus and the extirpation of the carcinomatous cervix by the vagina. The advantages of this procedure are that the abdomen is kept open but a short time, that the hemorrhage can be controlled better from below, and that the carcinomatous masses are not drawn back through the abdominal cavity. Of six patients thus operated upon, one died of septic peritonitis. In the last two months of pregnancy we have to consider the treatment which has in view the preservation of two lives. Cesarean section should be performed, which is followed by a Freund abdominal, the Zweifel combined, or, finally, the pure vaginal total extirpation. Of these procedures, the abdominal operation seems preferable.

We come next to the consideration of operable carcinoma in labor. Here we have the possibility of a spontaneous ending of labor through the diseased passages. This may be considered, if the disease is still in the early stages. If the carcinomatous infiltration has not involved the entire portio, and a more or less large zone of the uterine margin remains free and capable of dilating, the ovum may be extruded thus. When the carcinomatous masses cannot be crushed by the head, they should be cut away with scissors or the thermocautery as a preliminary, and the child should be delivered by forceps or by version. If the ovum is dead, its size may be diminished by perforation or by piecemeal operation, whichever will end the labor most effectively and in the best manner for the mother. Following the delivery we may consider immediate vaginal total extirpation, or its delay until the second week of the puerperium. The delay in these cases is suggested because of the size of the uterus. The advantages of the procedure, however, are that the uterus permits itself to be brought readily to the vulva, and that the wall of the vulva and the vagina have been so distended by the passage of the fetus that they do not afford an artificial hindrance. Occasionally, the size of the uterus affords difficulty. It can then be reduced by splitting it into two parts in the median line, but this endangers the reimplantation in the wound.

329. Summary. In the discussion of the subject of cancer I have endeavored to give a comprehensive view of the methods by which the disease can be combated. As such a statement must be, however, more or less confusing to the student, it is my purpose in this section to present briefly the indications for special treatment. The two principal methods of treating curable cancer are by the abdominal and vaginal routes. The sacral method affords no advantages which render it worthy of consideration. When the uterus is large and the disease has evidently extended to, if not into, the parametrium and is complicated with myoma, ovarian tumor, or the later stages of pregnancy, or when the vagina is undilated and narrow, abdominal hysterectomy should be preferred. Vaginal hysterectomy when carcinoma is limited to a uterus freely movable, not too large and accessible through a roomy vagina, has been the operation of election. The after-results, however, have demonstrated that vaginal hysterectomy, as ordinarily performed, is ineffective in that it does not afford opportunity for the removal of sufficient tissue to insure against early recurrence. The operator should keep two objects in mind in proceeding to perform any operation for carcinoma: 1, To insure the removal of a diseased organ in a healthy field, which is accomplished where possible by the removal of the upper part of the vagina and as much parametrial tissue as safety for the ureters and bladder will permit, thus getting beyond the isolated nests, which may be situated in the parametrium; 2, the exercise of such precautions as will avoid the implantation of cancerous material upon the healthy wound.

In the vaginal operation the operator has the choice of three methods of procedure for the control of hemorrhage. These are the use of pressure forceps or clamps, the electric cautery, and the ligature. The clamp procedure has the advantage of being more expeditious, in favorable cases permitting the removal of the uterus in a very few minutes. It has the disadvantage that it produces an increased amount of pain, from the weight and dragging of the clamps and the necessity of the patient being confined to the dorsal position. The retention of the clamps produces a certain amount of necrotic tissue in the peritoneal cavity after removal of the clamp, and causes increased danger of septic infection. The removal of the clamps, often as late as forty-eight hours, is sometimes attended with quite free after-bleeding, which may require their reapplication, under very great disadvantage, in order to prevent the death of the patient from hemorrhage. In a large hospital where there is a convenient electric-light plant or connection with the street current can be made, the electrocautery is ideal, otherwise it means the employment of special apparatus, which is cumbersome and requires expert skill to manage and maintain in order. The ligature method is slower than the clamp, but the hemostasis is more sure and the comfort of the patient increased during convalescence. Catgut is preferable to silk for ligation, because the latter is likely to become infected, cause sinus granulations and discharge will continue until the ligature disintegrates, sloughs away, or is removed, and causes worry and distress to the patient, inducing her to believe that the disease has recurred.

In performing an abdominal hysterectomy the method suggested in § 326 is the proper course. The uterine arteries should be ligated separately near their origin, the course of the ureters observed, and an extensive removal of the parametrium and upper part of the vagina made. This procedure, in my judgment, is more important than the removal of glands. Before closing the wound, bleeding vessels are carefully secured. When there is much oozing or a large surface has been denuded of peritoneum, gauze is carried through the opening into the vagina, packed into the cellular tissue upon each side, and the peritoneum united over it by a continuous catgut suture. The abdominal cavity is cleansed; the wound is closed as in ordinary abdominal procedures. The gauze packing in these cases may be left in for from six to eight days and then be removed through the vagina.

330. Chorio-epithelioma Malignum. Some twenty years ago a condition intimately associated with pregnancy was recognized as a form of malignant disease. (Fig. 543.) It has been described under the various names of deciduoma malignum, deciduomatous sarcoma, sarcoma deciduocellulare, blastoma, deciduo-chorion cellulare, syncytium carcinoma, syncytio malignum, the destructive bladder mole, destructive placental polyp, and the title of our section, chorio-epithelioma malignum. These various designations indicate the attempts upon the part of the different investigators to name the structural origin of the condition. (Fig. 544.) It was formerly supposed to be due to the degenerative changes resulting from a cyst mole, from which metastases were carried by the veins to different points, and growths of the similar epithelial structure followed.

Later investigations, however, have disclosed that a mole is not necessary to its development, although favoring its growth.

Recent investigators agree that the disease arises from the fetal cells, composing the villi and chorion, the Langhan's and the syncytial cells. The gravity of the condition seems to depend on which class of these cells predominates. When the disease originates in the Langhan's layer, it is extremely malignant: when from the syncytial cells, comparatively harmless.

Marchand, in 1895, asserted that there were two types, the typical and the atypical. His typical form exhibited extreme variations in its structure and course. Schlagenhaufer, in 1899, taught that recovery might follow: 1, Spontaneous expulsion of the tumor from the uterus; 2, the use of the curet; 3, partial removal of the tumor by the knife, the remainder being left in the pelvis. Schwank, on the other hand, had such unfavorable results that he considered it a crime to operate. This diversity of opinion led to more careful investigation and Dr. James Ewing, of New York, gives the following classification: 1, Syncytoma, a typical choriona of Marchand, in which there is more or less diffuse infiltration of the myometrium, forming a large tumor which enlarges the uterus without perforating it and does not produce metastases. The structure of the growth consisted of large wandering syncytial cells, found in the walls of sinuses and the musculature. 2, Chorio-adenoma destruens, malignant placental polypi. The sinuses of the uterus were infiltrated, causing enlargement, without splitting, of a compact growth. Metastases occurred in lungs and vagina. Its structure showed villi, Langhan's cells and syncytium in more or less orderly arrangement. 3, Choriocarcinoma, a

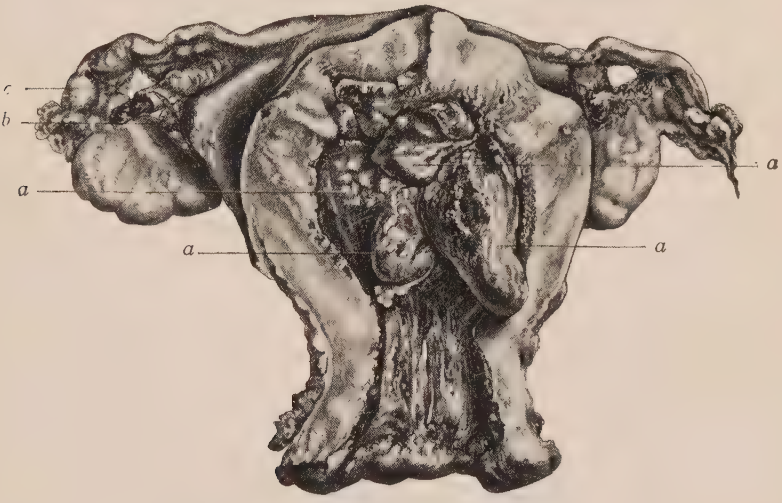


FIG. 543.—Chorio-epithelioma of the Uterus.
a, a, a, a. Nodules of neoplasm. *b.* Stump of round ligament. *c.* Thrombus projecting from ovarian artery.

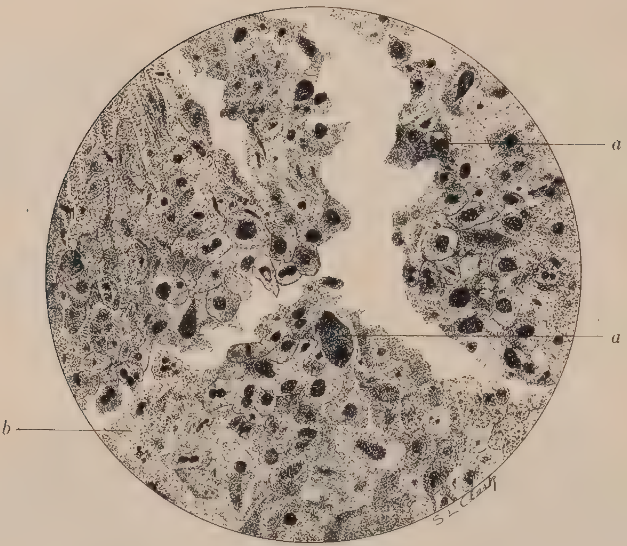


FIG. 544.—Chorio-epithelioma Malignum. (Section furnished by Drs. C. P. Noble and S. E. Tracy.)
a, *a*. Large syncytial cells. *b*, Blood detritus.

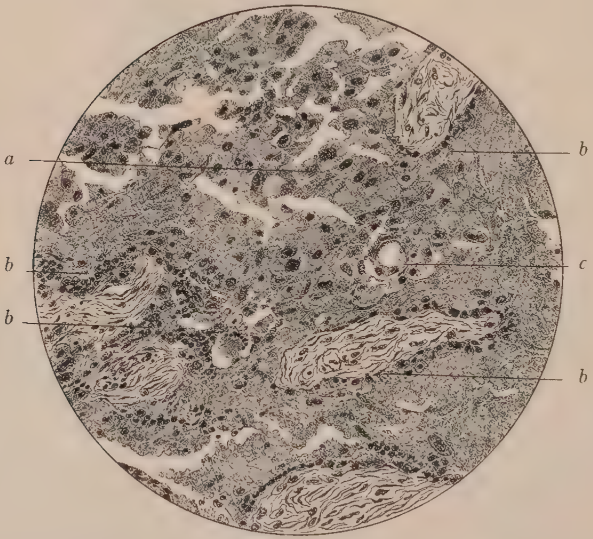


FIG. 545.—Histologic Section of Chorio-epithelioma.
a. Collection of large decidual cells. *b*, *b*, *b*, *b*. Chorionic villi showing proliferation of their cellular coverings. *c*. Large multinucleated cell containing a vacuole.

relatively small circumscribed tumor in the musculature which tended to perforation of the uterus without its enlargement, and resulted in both local and general metastases. The structure consisted of Langhan's cells and syncytium in masses often imperfectly differentiated.

Etiology. The disease occurs during the period of active reproductive life and follows an abortion, either intra-uterine or tubal, a normal labor, or frequently a hydatid mole. The disease is not dependent upon pregnancy necessarily, for it has been recognized in the unmarried woman and in the testicle of the male. In such cases it is supposed to originate in inclusion cells. The occurrence of the disease has been attributed to want of nourishment in the villi. Pick and E. P. Davis report cases in which the disease has developed during pregnancy and Pick reported a tumor situated in the posterior wall of the vagina, which, upon removal, contained distended chorionic villi with proliferated syncytial cells.

Symptoms. In a few days to a few months following the termination of a pregnancy the patient suffers from repeated bleeding. As this increases in severity, the patient becomes markedly anemic. There will also be a profuse dirty, watery discharge. The continued drain, the hemorrhage and discharge, give rise to extreme weakness and a cachectic appearance. Curetment of the uterus in a condition like this results in the removal of a varying quantity of soft, friable material, which looks like placenta and bleeds freely. Oftentimes it will contain necrotic tissue, causing an extremely offensive odor. Very frequently, on the anterior wall of the vagina, a metastasis in the form of small round masses will be observed. On being opened, this will present tissue similar to that removed from the uterus. Similar metastases result in the formation of growths in other portions of the body. Thus it has been carried to the lungs, pleura, diaphragm, spleen, pericardium, kidney, liver, intestines, or even the brain. When the diseased tissue is cureted from the uterus, the patient has but temporary relief; hemorrhages again return, and a second curetment will remove tissue similar to that which was found at first.

Diagnosis is easy in advanced cases, but difficult in early stages. It is determined both by clinical observation and microscopic investigation. The rapid return of hemorrhage after curetment, in which no fetal products are found, the foul discharges, the profound anemia, elevation of temperature, large uterus, dilated os, soft friable tumor, and the metastasis with the revelations of the microscope, should render the diagnosis positive. The rapid cachexia should awaken suspicion. The disease so closely resembles both carcinoma and sarcoma as to render it difficult to differentiate between them. The structure having no stroma and being disseminated by the blood-vessels rather than by the lymphatics, makes it closely akin to sarcoma. From sarcoma, however, it is differentiated by the fact that it is composed largely of epithelial elements.

Prognosis depends upon the particular manifestation. An early recognition is of the greatest importance and equally so is the determination of the particular form. In the first form an early curetment and in the second a curetment or partial removal may prove curative. In the third the only hope is in the prompt extirpation of the uterus. Marchand reports twenty-eight cases with twenty-four deaths. It is one of the most malignant of growths and the third form frequently terminates in six months, whether operation is done or not. Veit reported recovery after metastases had occurred, but this was evidently in the second form (page 741).

The frequent difficulty in diagnosis is well illustrated by the history of the following patient, kindly given me by Dr. M. F. Herman, of this city.

"Mrs. M. L., a woman of thirty-three years, came under my observation in August, 1908, stating that puberty was established at the age of thirteen years, periods regular, lasting three to four days, scanty, and attended with pain the first day. She married at the age of twenty-eight, and two years later gave birth to a child after a normal labor, thirteen months subsequent to which she became pregnant again; then the labor, five weeks early, was complicated by adherent placenta, a part of which was retained and thrown off three days later. The first child was a girl, the latter a boy, and it died eighteen months subsequently with tubercular meningitis. Five months after the death of the child, she again became pregnant, but aborted at the fourth month without special reason and was confined to bed for two weeks. Another pregnancy occurred at the end of nine months, the patient having menstruated but twice following the abortion. She aborted in this pregnancy, again at the end of four months, and was cureted, when a large amount of friable tissue was removed, of which no microscopical investigation was made. The patient got about in two weeks, but continued to suffer profuse, irregular bleeding, and two months later was again subjected to curetment, when an equal quantity of friable tissue was removed. Hemorrhage was arrested for a short time, but again became profuse and was so excessive that she was taken to St. Joseph's Hospital, where she was cureted by one of the staff of that institution, and the same kind of tissue removed as in the two former curetments. A blood examination then showed:

Leukocytes	7,500
Erythrocytes	3,000,000
Hemoglobin	50 per cent.

She left the hospital in two weeks, but the former symptoms promptly returned in aggravated form, when Dr. E. E. Montgomery was called and diagnosed the condition as chorio-epithelioma. She was again removed to the hospital, where he did hysterectomy. The blood-count at this time gave:

Leukocytes	8,500
Erythrocytes	2,500,000
Hemoglobin	40 per cent.

The operation was followed by an uninterrupted convalescence, and the patient has since enjoyed good health. Her weight has increased from 102 to 147 pounds, and she regards herself in perfect health now, over two years subsequent to the operation."

For the following pathological report I am indebted to Dr. P. Brooke

Bland. "The specimen received for examination consisted of the uterus, tubes, and ovaries. The appendages show no gross pathologic change, but the uterus is uniformly enlarged and about three times its normal size. In consistence it is soft and elastic, and a considerable sized mass can be palpated through the uterine wall and is also recognized by introducing the finger through the uterine canal, when it offers the sensation of a submucous fibromyoma. The wall of the uterus was easily incised and much thickened from enlargement and edema. Opening the cavity disclosed an ovoidal tumor the size of a tangerine orange, of a bluish-purple color, resembling an organized blood-clot, which was attached by a broad base to the posterior uterine wall. The tumor was moderately firm in consistence, and when cut open through its attachment to the uterine wall was found to have infiltrated the latter through more than one-half of its normal thickness. (Fig. 546.) Uterus contains growth diagnosed as chorio-epithelioma. Microscopic examination of stained sections disclosed different elements; mostly the tissue is composed of syncytium, large decidual cells, blood detritus, and blood sluice-ways. The syncytium appears as large masses of protoplasm of various shapes, rounded drawn-out bands and whorls, or irregular masses. These areas are vacuolated and in many portions contain considerable blood. These protoplastic masses are occasionally broken by spaces which are possibly blood-channels, as many of them are filled with blood-cells. In portions of the sections, collections of very large oval and round cells are seen. These cells are generally congregated in masses, and as a rule are found on the border-line of the blood-channels. They are unusually large and contain large oval and prominent staining nuclei. Their protoplasm is

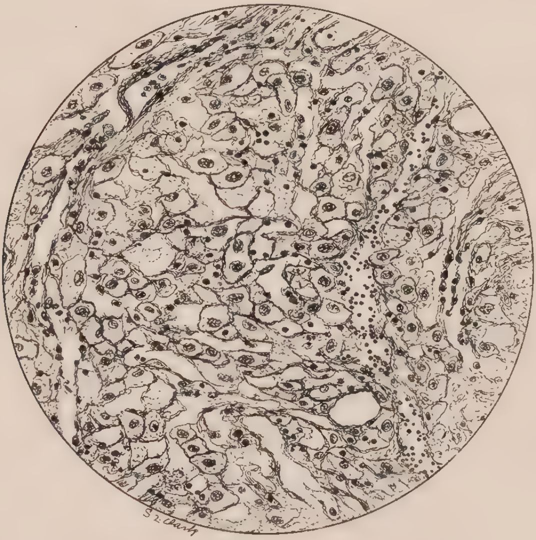


FIG. 547.—Microscopic Section of Chorio-epithelioma taken from Fig. 546.

pale and generally ill-defined. These cells have the general characteristics and appearance of the decidual cells and exhibit marked nuclear activity. In some areas of the sections, leukocytic infiltration is observed, though not so marked. None of the sections betrayed the presence of chorionic villi. Those taken from the line of invasion disclosed cell-infiltration of the mural substance of the uterus.

Histologic diagnosis: Chorio-epithelioma malignum.

In the extirpation of the disease the abdominal operation is preferable, for the reason that there is less danger of fragments of the tissue being forced into the veins.

331. Endothelioma Uteri. A comparatively recently recognized form of malignant disease occurs in various tissues of the body and is known as endothelioma. It has its origin in the endothelial lining of the blood- and lymph-vessels and the serous membranes. Endothelioma manifests itself in many ways, according to the structures involved and the particular endothelium from which it has originated. The disease may occur in the cervix, although this is extremely rare, and resembles closely the squamous-cell carcinoma. Diagnosis can only be determined by the employment of the microscope. Examination of the section of tissue reveals the squamous cell-layer intact, free from any infolding process or tendency to project into the underlying tissue. The growth consists of spaces lined by one or more layers of cells, resembling lymph-spaces. Where these spaces are obliterated by masses of proliferative cells, there is a resemblance to the squamous nests, but in the latter the outer layer assumes a cuboidal or more cylindrical

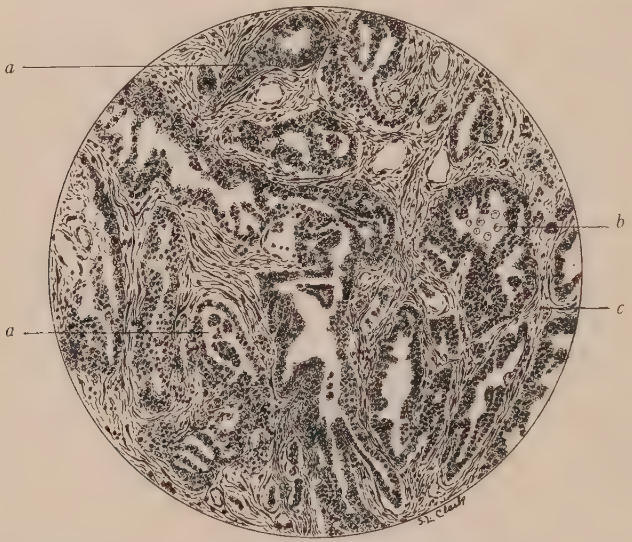


FIG. 548.—Endothelioma of the Uterus.
a, *a*. Endothelial cells infiltrating lymph-spaces. *b*. Blood-cells. *c*. Connective-tissue matrix.

form and the nuclei are more vesicular. (Fig. 548.) When the disease involves the body of the uterus, it is likely to form a tumor of considerable size, and in its course and progress will resemble sarcoma. Metastases usually occur through the blood-vessels. In my own experience, I have noted that it is prone to extend upon the peritoneal surface and result in the formation of numerous nodules over the peritoneum, and frequently eventuating in intestinal obstruction. Unless the latter symptoms occur, the disease is singularly free from pain the patient complaining rather of the progressive emaciation and the continuous loss of strength. The prognosis is unfavorable, since the disease progresses by both the lymph- and blood-vessels, but more frequently by the latter.

332. **Sarcoma uteri** can involve either the mucous membrane or the wall of the organ, and hence is divided into two groups. Clinically it is found either in the body or in the cervix—more frequently in the former—and this holds true in both its anatomic varieties. Sarcoma of the mucous membrane is one and one-half times more frequent than the same infection of the wall. It differs from carcinoma in that it is a growth which springs from the connective-tissue cells, the latter from the epithelial.

Varieties. Sarcoma is divided into sarcoma of the cervix and sarcoma of the body. Sarcoma of the cervix occurs generally as grape-like clusters, protruding from the cervical mucous membrane, and it is also called sarcoma colli uteri hydropicum papillæ, or, from its grape-like appearance, sarcoma botryoides. From its soft appearance it has been described as myxomatous, but Pfannenstiel says this condition is due to a form of lymphedema. In the body of the uterus the disease may occupy the mucous membrane or the mural structure of the organ, and be either diffuse or circumscribed. Sarcoma of the uterine wall arises in either the mural portion of the uterus or from degeneration of a fibromyoma. The latter origin is regarded as the more frequent. It is often difficult to make certain whether the disease has originated as a primary sarcoma of the wall or from a myoma. When it is recognized as situated in a myoma or surrounded by myomatous tissue, the latter is evidently its source. Where the myoma is associated with a sarcoma which involves the adjoining tissue as well, the origin may remain doubtful. Sarcoma of the mucous membrane overlying a fibroma is frequently observed.

Pathology. Sarcoma involving the mucous membrane occurs in the diffuse and polypoid forms. The former does not necessarily involve the entire surface, like a fungous endometritis, but appears as a more or less circumscribed growth, from the surface of which there are irregular projections, giving the new formation a roughened, often villous appearance. The polypoid variety is nearly three times as frequent, both in the body and in the cervix. Sarcoma of the mucous membrane is twice as frequent in the body as in the cervix. The grape-like clusters, already mentioned, protrude from the external so suspended by a pedicle. The extremities of these projections are soft, oftentimes easily broken down, and they form a dense cluster protruding from the os, in which the different portions of the growth are molded or flattened by pressure. The polypi arise by a firm, more or less broad pedicle from the mucous membrane of the cervical canal and project from the external os into the vagina, showing a great resemblance to a mole. While the foundation part of the new formation of the cervical canal consists of firm, fibrous tissue, the vaginal portion is strongly edematous, soft, almost fluctuating, and easily broken down. The growth has a pedicle which often is thinned and drawn out, made up of a number of individual berries which are situated so close together that they are flattened. (Fig. 549.) They vary in size from a grain of corn to that of a grape, and their stalk shows a smooth, moist, glistening surface of a yellowish-white, brownish, or blue-black color, alterations which are produced by the entrance of blood into the tissues. The berries are most often bluish in color, and in some places vitreous changes are seen. The berry contains a bright or light yellow fluid and collapses upon its escape. These projections, however, usually have about the appearance, if not the consistency, of a mucous polypus. The growth has its origin in the superior layer of the mucous membrane and assumes the grape-like form only after its extrusion into the vagina. This form is produced by interference with the circulation from pressure upon the pedicle, which, as a rule, causes edema and swelling of the intravaginal portion. The disease progresses slowly, but often is carried and disseminated by the blood-vessels. The individual cells are mostly of the roundish or spindle form. Between them almost uniformly is found a very fine intercellular substance. Parts of the new formation are divided by fissures or ramifying spaces, which, from the high cylindric epithelium and the nuclei situated in the cells, are recognized as the cervical glands. These glands are not suffi-

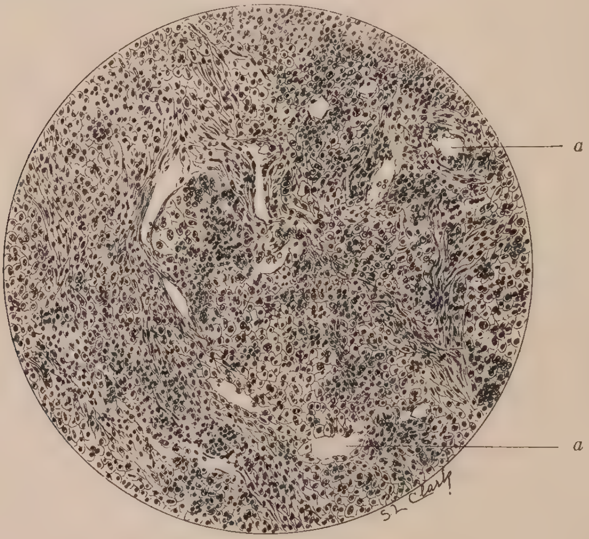


FIG. 549.—Sarcoma of the Body of the Uterus.
a, a. Characteristic appearance of blood-vessels minus distinct wall, the wall being formed by the malignant cells.

ciently numerous to justify the appellation of adenosarcoma, a term sometimes applied to them. The diffuse form affects the body. Its progress is slow and it extends upon the surface, showing great reluctance to the invasion of the subjacent wall. As it follows the surface it is manifested by large or small nodular papillary or villous projections. The mucous surface begins to degenerate and hemorrhage appears. In rare cases the muscular structure is rapidly involved. Generally the tissue involved exhibits a reduction in its vascularity. When the vessels are specially abundant, it is designated as the hemorrhagic or telangiectatic variety.

The appearance of a section of sarcoma is quite varied. The less connective tissue present, the more homogeneous it appears. Most generally it is marrow-like, and, in advanced stages, presents a soft, smeary, and very fragile mass. With an increase of the connective tissue the borders are folded and irregular, inclosing a homogeneous section. The structure undergoes marked changes under myxomatous alteration or serous penetration, and not infrequently apoplectic nests are recognized and cysts are formed.

The muscular walls are especially resistant, and become thickened, while the disease extends in the direction of the least resistance, which is into the cavity of the uterus. Usually the uterus is not enlarged; when it becomes so, the enlargement is uniform. The uterus is hard or soft, according to the degree of extension. In rare cases the progress of the disease and uterine hypertrophy are simultaneous. Under these circumstances the growth attains to the size of a child's head; in rare cases it shifts to the internal os and causes severe hemorrhage, serous discharge, or purulent destruction. In rapid extension the tumor can reach the ribs. Occasionally it penetrates the uterine wall, projects upon the peritoneal surface, involves the peritoneum or the intestine, results in suppurative peritonitis, and death rapidly follows. It can become encapsulated and penetrate the intestine or the abdominal wall, and form a fistula. Fistulæ of the rectum and bladder are rare in sarcoma, but frequent in carcinoma. The disease seems inclined to limit itself to the uterus, and metastasis to other organs occurs late. The disease can grow through the uterus and involve the parametric tissue, but this only in advanced cases. A polypoid growth may extend and fill up the uterine cavity and lie upon healthy tissue without involving it.

Sarcoma of the wall appears in a rounded form, with folded or lapped borders. The uterus is hypertrophied. Section of such a tumor shows a yellowish-white or grayish-red surface. The discharge is a milky, soft tissue, and its structure would indicate that it had originated in a fibromyoma. It is very difficult to decide whether the myoma is a cause or a coincidence. A myoma is not infrequently situated near a sarcoma of the mucous membrane, from which it can become involved. Polypoid growths are occasionally the size of a fist, and may have a broad base or a long, thin pedicle. When a polypoid growth pushes into the cavity, the remaining portion of the mucous surface may remain long uninvolved. The existence of the new formation develops an inclination to expel it as a foreign body, by which the os is dilated, and the tumor, hanging by a pedicle, is extruded into the vagina. Portions of the tumor may disintegrate and be discharged. The cervical form of the species is rare, but sometimes projects from the os as a grape-like cluster, which may fill out the vagina and may even project from the vulva. These polypi most frequently originate from the posterior cervical wall and are soft growths, which show but little inclination to break down.

A second form resembles the cancroid, but is softer, less easily broken down, and does not so rapidly seize upon the other lip. The spindle-cell structure predominates in the cervical tumors. Myxosarcoma and angiosarcoma are frequent. Sarcoma of the cervix shows but little disposition to invade the uterine body or the vaginal vault. It most frequently penetrates the cellular tissue of the parametrium.

Growths are described as spindle-celled or round-celled, according to the variety of these cells which predominate, as none are pure. The diseased structure is surrounded by a zone of irritation cells, which are difficult to distinguish from the small round-cell. Weil reported the growths occurring in the relative frequency of 35 per cent. spindle-cell, 45 per cent. round-cell, and 25 per cent. mixed-cell tumors.

Ruge recognizes four Groups: 1. Giant-cell sarcoma. The cells of the intervening gland tissue are largely increased. The cells—of round, sometimes spindle, form—are irregularly arranged, and their nuclei often exceed in size the usual cells. 2. The intermediate tissue cells, which are changed in the large spindle form to resemble the decidua cells. They are differentiated by their size, situation, and irregular form. 3. Small round or spindle cells, between which lie irritation cells. 4. Smaller round-cell sarcoma, which shows a great increase of cells, irregular in size and form.

The influence upon the glands of the mucous membrane gives variety. Generally, the glands are compressed and disappear, but occasionally they are retained, and form extensive areas within the tumor, producing what is known as adenosarcoma. The origin of sarcoma is difficult to fix; the microscopic appearance would indicate that it was from the coats of the vessels. A tumor in which there is a great increase of the vessels is known as an angiosarcoma.

Disturbances in nutrition cause edema and swelling of the cells; this condition simulates myxomatous degeneration, and has been called myxosarcoma. Lymphosarcoma is the name applied to those cases in which the disease originates in, and follows the course of, the lymphatic vessels. Myosarcoma is an engrafting of the disease upon a fibroid, and the term adenosarcoma indicates that glandular tissue has been included within the growth. Fibrosarcoma usually exhibits a roundish growth. The entire new formation may present a degeneration into sarcomatous tissue, so that upon section it exhibits a soft, marrow-like structure, or may be somewhat firm and uniformly opaque, with moist or mottled surface. Frequently the tissue resembles fish flesh. At other times the myoma has undergone sarcomatous change only in parts of its structure, and these points of degeneration give the section a striated appearance, in which the nodules are distinctly recognized. The sarcomatous degeneration is most frequently found in the center of the mass, so that it is surrounded by a myomatous crust. Gusserow's assertion that the fibrosarcoma continually loses its capsule is of no significance, for not every myoma has a capsule.

Fibrosarcoma may attain an enormous size, forming a tumor which reaches beneath the ribs. If the tumor is projected into the uterine cavity, it is generally covered by the mucous membrane which is not penetrated by the disease, and occasionally the tumor, thus covered, is extruded into the vagina. The submucous tumor mostly springs by a broad base from the wall of the uterus, in which no sarcomatous tissue is found. If the submucous tumor has attained a large size, disturbances of nutrition may have already occurred which lead to suppuration. The longer the growth exists, the greater the inclination to destruction, especially if it is soft and has grown rapidly. In the submucous growth the uterus tends to enlarge, especially when the tumor is of the interstitial variety. On the other hand, the intraligamentary subserous sarcoma produces an enlargement or alteration of the uterus, which should not be overlooked.

These sarcomata, like the myomata from which they mostly project, are but slightly supplied with vessels, though they frequently have a distinct telangiectatic form.

Much diversity of opinion exists as to what constituent of the wall affords origin for the sarcoma cell. Virchow attributed it to the intercellular substance: "Their cells increase by division, they consist more and more of round cells, beginning small, later larger, with considerable nuclei, as large mucous bodies, while the intercellular substance is looser and more spongy." Kahlden believed that sarcomatous degeneration resulted from the immediate transformation of muscle-cells into roundish cells; their poles then became oval or blunted. Whitridge Williams says that under rapid increase of the number of cells this section of tissue passes into pronounced spindle-celled sarcoma with irritation cells. Ricker explains the growth "naturally by a growing through of myoma bundles by the side of the sarcoma tissue." Ruge says, "The impression exists, as if the fine, small muscle-cells passed over directly into the sarcoma cells." Gessner, from extensive investigations, concludes: "The round-cell sarcoma continually takes its origin from the connective tissue, and, likewise, the majority of the spindle-cell sarcomata; but that in all probability to the smallest part they lead back to an immediate transformation of muscle-cells."

Etiology. The cause of sarcoma is unknown. Cohnheim's theory that it originates from some congenital defect affords no further information. In other parts of the body sarcoma is attributed to injury, but the occurrence of rapidly developing sarcoma following trauma is no indication that the latter is the cause. Injuries during parturition, difficult delivery of the placenta, frequent labors, and blows upon the sacrum have been assigned as causes for its development. Labor, however, does not seem to be a factor, as two-thirds of the cases are below the average in childbearing, and in a great majority there is a long interval between the last labor and the development of the disease. The cervix is most subject to injury during labor, while the body of the organ is more subject to the disease. Sarcoma, like cancer, is due to some chemical or toxic action on irritated cells and owe their difference to the structures involved.

Predisposing factors are: *Age.* The cases of sarcoma of the mucous membrane preponderate between the ages of fifty and sixty, although a large number are found between the ages of five and twenty; sarcoma of the wall is absent in the young, while the maximum number is found between the ages of forty and fifty. *Trauma, parasitic irritation, syphilis,* and the presence of *fibroids* are included, but, if factors, the query becomes important, why are the cases not more frequent? Gusserow believed that the disease originated from changes in the fibroid, and Martin saw it follow the ergot treatment of fibroid in six cases. The latter number, however, is too small for a definite conclusion. *Heredity* as a factor is undetermined. *Poverty* has been given as a cause, but Weil has shown that one-fourth of the cases of sarcoma of the mucous membrane have occurred in the well-to-do.

Symptoms. Sarcoma, like carcinoma, presents no characteristic symptoms. The more important indications or signs which should awaken suspicion of its existence are hemorrhage, discharge, pain, and, in advanced stages, cachexia. In more than one-half of the cases bleeding is the first symptom, and is rarely absent. It begins by increased menstrual flow, then a bloody, watery discharge, which is not sudden, as in fibroma, but more or less continuous. It comes from the associated endometritis, while a stronger flow is indicative of destruction of the new formation. Rupture of vessels and more or less severe hemorrhage occur in the diffuse variety, but the polypoid form does not break down readily. In the cervical variety the disease occurs quite early in life. It has been observed at two and one-half years and displays a preference for the young at the period of awakening to sexual activity. The earlier symptoms are similar to those of mucous polypus, such as hemorrhage and discharge. During sexual activity there is first increased menstruation, then irregular discharge of blood, later pain, which results from the pressure of the increasing growth upon the cervix. The extension of the disease to the parametrium causes pressure upon the pelvic nerves and the formation of masses which press up the uterus and lift it out of the pelvis. The hemorrhage and diffuse discharge result in a high degree of anemia, and finally cachexia appears, and the patient ultimately perishes from marasmus and the penetration of the disintegrating tumor into the abdominal cavity with fatal peritonitis. In the frequently recurring sarcoma of the mucous membrane, which appears at the climacteric, hemorrhage is the first, and often for a long time the only, indication of the disease. The obstruction to the uterine discharge will frequently result in the formation of a pyometra or hematometra and the development of a tumor, which will reach to the ribs. The uterine collection may be bloody or mixed with tissue and it often attains an enormous size. Discharge is the first symptom in about one-fourth of the patients and does not cease with the further progress of the disease. It begins as a quite abundant, thin, watery fluid, which is later mixed with blood.

Such a discharge continuing for a length of time as the only symptom should arouse a suspicion of the existence of sarcoma. It is true that discharges of this character are not rare as a symptom of submucous fibroids, but its occurrence after the menopause is an almost positive indication of sarcoma. In the first stage there is no disagreeable odor beyond the stale sweetish smell, but with the destruction of the new formation the discharge becomes purulent, sanious, and has a foul odor. The carrion-like smell so characteristic of cancer is not usually present, because the large collections in the uterus are retained by the obstruction, and, owing to the arrangement of the vessels, are afforded better nutrition, so that the new structures do not so easily break down. The disease generally appears in the polypoid form. Sanious discharge occurs when the uterus forces the new-growth out, the os is dilated, and the diseased mass is extruded into the vagina. The extruded parts are to some degree deprived of nutrition, and this results in further destruction. The discharge in the vagina has abundant opportunity for exposure to infection from saprophytes, which accelerate the rapidity of destruction. It is then mixed with ulcerative pieces of tissue, which often are thrown off in large masses, and these still further disintegrate in the vagina. A bloody discharge will follow and pyometra may occur, but this never attains the same extent as the hematometra. Pain is absent at the beginning of the attack, but is aggravated with the increase in the size of the uterus, the persistent pressure in the pelvis, and the sensation of fullness in the abdomen. As the uterus becomes enlarged, pain is referred to the ilium or to the sacrum and radiates down the thighs. The extension of pain is due to the involvement of the uterine nerve-endings by the new formation. Pain is greatly aggravated when the disease has passed beyond the boundaries of the organ and infiltrated the pelvic tissues and made pressure upon the large nerve-trunks. In the polypoid variety the pain becomes labor-like when the structure attains a size which leads the uterus to expel it. Painful attacks do not occur at such regular hours as in carcinoma. Inversion of the uterus has been caused by the efforts of the organ to expel its contents. Vesical symptoms are comparatively frequent when the disease is confined to the uterus and are manifested by more frequent desire to urinate, pain in evacuation, and distressing vesical tenesmus. These symptoms are more particularly seen in the circumscribed variety and are, consequently, not the result alone of increased weight. In advanced stages constipation is marked from pressure of the infiltrate upon the rectum and partly from decreased nutrition. Such patients apply for relief from constipation and the pain at stool. The infiltration of the uterus can attain to considerable dimensions, but, unlike carcinoma, shows but little inclination to compress or involve the ureter. As the cervix rarely is involved, vesical and rectal fistulæ are infrequent. The constant drain will necessarily affect the general health, and the cachexia is greater than in cancer. In sarcoma of the uterine walls, frequently known as fibrosarcoma, the great diversity of symptoms depends upon the situation of the disease, and makes it impossible to present a clinical history, as in other forms of trouble.

However, one of the first signs is an irregular bleeding, following the menopause, in a woman who has had a myoma. The myoma rarely delays the climacteric longer than the fifty-fifth year. The continuation of the menses at an advanced age or their return after ceasing should indicate the probable degeneration of an existing myoma. Following the climacteric, the myoma ordinarily ceases to grow or decreases in size, while a sarcoma of the uterine wall increases. A rapid growth subsequent to the climacteric is with rare exceptions an indication of sarcomatous degeneration of a myoma. A symptom constant in sarcoma and always absent in myoma is a premature and rapid cachexia. From great loss of blood the myoma may cause anemia, but the sarcoma causes emaciation. When the cachexia occurs without much loss of blood, it indicates an unfavorable influence upon the blood composition and formation. The cachexia is preceded by a sense of weariness, pain in the head, nausea, sleepiness, and universal pain throughout the body. Furthermore, there is a sensation of tension in the belly without marked increase in the tumor. Difficulty in urination without compression is also present, and disturbance of nutrition without other assignable cause is quite marked. A profuse watery mucous or watery bloody discharge occurs similar to that from an ulcerating submucous myoma, except that in the latter the growth is not discharged in pieces, but the tumor retains its integrity and disintegrates from the surface, while in sarcoma large portions of the mass are thrown off or are easily broken off by the hand. Pain is produced when the disease breaks through the walls of the uterus and undergoes great extension. Labor-like pains are caused if the uterus attempts to discharge its contents. Sarcoma occurs in but a small percentage of cases of myoma, yet sufficiently often to justify its being reckoned as a factor. While the possibility of this degeneration is no indication that every patient suffering from myoma should be subjected to an operation, still it is a warning which should awaken suspicion when adverse symptoms develop in the tissue thus affected. Paget described a peculiar form of this disease under the designation of recurrent fibroids. Whether in these cases successive mucous fibroids were discharged or the condition was sarcoma from the beginning only the microscope could have determined. Schröder made a vaginal extirpation in a patient from whom he had removed seven successive polypi, the last three of which were sarcomatous. The removal of sarcomatous growth long years after previous removal of fibroids does not prove that the former were malignant. The possibility of such changes occurring in tumors should be decided by more frequent examinations of removed growths by the microscope, in order that extirpation may be resorted to promptly when malignancy is demonstrated.

It is asserted that metastasis is late in its occurrence in fibrosarcoma. This assertion is correct only as to the length of time symptoms exist prior to such manifestations, but does not indicate the long existence of sarcoma.

The duration of sarcoma of the cervix is about one and one-half years, about the same as that of cancer of the part. It is more difficult to fix the term of the disease in the variety involving the uterine mucous membrane, as the earlier symptoms do not come under the observation of the physician. Cases have been reported as having survived several years; the average duration, however, is about two years. The polypus is slower in its progress, probably dependent upon a slighter inclination of this form to invade the muscle wall. Metastases occur in about one-fourth the cases and affect any tissue in the body. The structures most frequently affected are the lungs, peritoneum, lymph-glands, and intestines. In the cervical variety it is likely to extend to the vagina, where the involvement is superficial and does not interfere with cure if extirpation of the uterus is performed, provided the operation is done early. To afford hope of recovery the diagnosis must be made early, and not after the recurrence of the disease following curetment or amputation of the cervix has demonstrated its malignant character. The polypoid growths from the cervix should be recognized by their peculiar appearance, and the microscopic examination of the cureted scrapings should render the diagnosis certain. The reformation of the polypus should lead to the suspicion of malignancy, and a careful microscopic examination should be made to determine its true character. In the fibrosarcoma it is still more difficult to fix the duration of the disease, as we have no means of knowing when the degeneration of the fibroid begins. Cases have been reported in which tumors existed for ten years. These are probably cases in which the myoma has existed for a long period and only in the later years become malignant. Metastases in this form appear late, follow the course of the blood-vessels, and, like the other forms of the disease, involve the lungs, pleura, liver, rectum, omentum, and kidneys. Fibrosarcoma is frequently regarded as a comparatively benign tumor, because it remains proportionately limited to the uterine cavity, but this is incorrect, for this property is common to mucous membrane sarcoma and cancer of the body of the uterus as well. If metastasis is any criterion as to malignancy, we must regard parenchymatous sarcoma as more malignant than the mucous, for in the latter metastases occur in only one-fourth of the cases, while in the former but one-fourth escape. Although it is impossible to fix the duration of life, it would seem to be longer than in the other forms of malignant disease. Its progress is attended with the same symptoms as in other forms of malignancy. Its termination is usually death from exhaustion, bleeding, and discharge, and by the further extension of the disease into the various parts of the body. Sepsis plays a less important part than in the mucous variety, and ulceration does not appear so frequently, and, when present, by the evacuation of the ulcerating mass does not usually cause general symptoms, though a purulent peritonitis has been frequently reported as a cause of death.

Diagnosis. Sarcoma of the mucous membrane can be determined accurately by microscopic examination only. Other means will be sufficient to render certain the existence of malignant disease, but the variety is determined only by the microscope. Neither the condition nor symptoms offer anything characteristic of sarcoma, while a majority of the diseases of the uterus afford similar symptoms.

An elderly woman with a large uterus, who suffers from a profuse watery discharge mixed with blood, should be suspected of having sarcoma. Submucous myoma sometimes causes a similar discharge, but the uterus is greatly enlarged, and it does not occur for the first time in advanced age, and is always accompanied by bleeding.

Senile endometritis may cause a profuse discharge, but the discharge is purulent, and generally has a disagreeable odor. The organ presents the characteristic changes of old age, and is not large.

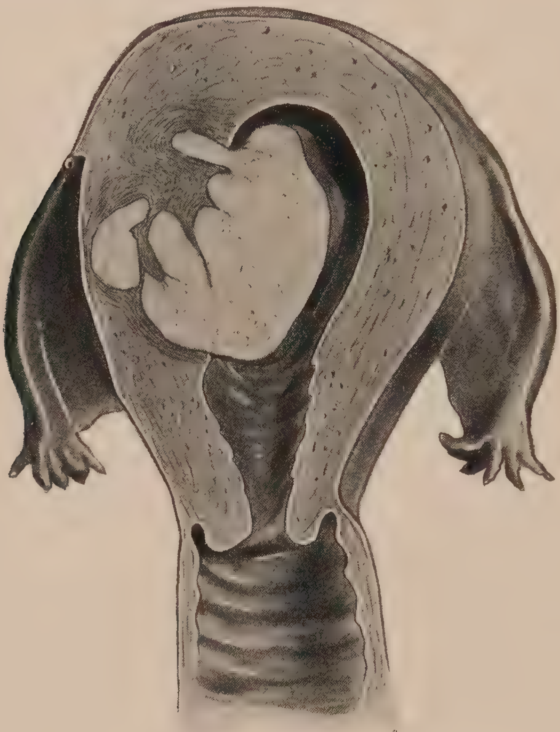


Fig. 550.—Fibroma Undergoing Sarcomatous Change.

A second suspicious sign is vesical tenesmus, which should be regarded as an indication of malignant disease when no other cause exists.

Sarcoma of the uterine body is naturally difficult to diagnose. It can be covered completely by the cervix and the vaginal portion, and when a large cauliflower-like mass projects from the cervix, it may be either sarcoma or cancer, and the microscope only can determine which. In the differential diagnosis there are a variety of diseases which must make the diagnosis uncertain.

The uterine body is always enlarged, but does not differ essentially from the enlargement of chronic metritis, myoma, and carcinoma. The sarcomatous uterus is not so hard as the myomatous organ. In malignant disease the much enlarged organ indicates sarcoma, but the carcinoma may be superimposed upon a myomatous uterus. In the latter the form of the uterus is irregular.

Fungous endometritis, a mucous polypus, and submucous fibroid may require the use of the microscope to differentiate them. Positive proof of malignant disease is not obtainable by the touch. A sensation of softness is common to mucous polypi, submucous myoma, and mucous membrane sarcoma. Pieces of the latter can be broken off with the finger, as also from other growths when ulcerating. Touch with the finger is not always free from danger. It will be safer to employ the microscope upon the scrapings obtained by curetment.

The inexperienced investigator may be confused by the resemblance between sarcoma and interstitial endometritis, with more or less destruction of the glands. In doubtful cases examine all the parts removed before making the decision that malignant disease does not exist, and, if then in doubt, keep the patient under close observation. If she continues to bleed, make a second curetment, and again examine the scrapings.

The abundance and variety of the cells in a specimen are of significance in the diagnosis of sarcoma. In round-cell sarcoma the cells are round and thick, and exceed in size those of the intermediate tissue, in which are found irregular cells. Kellar places particular stress upon the fact that the individual nucleus is differently formed and varies in the way it accepts the color stain, so that the smaller nuclei are always better colored than the larger. When glands are absent, the cells are usually pressed together and the epithelium is flattened. If the glands have largely decreased in interstitial endometritis, there are distinctive traces of connective-tissue formation in the intervening structure, which is penetrated in all directions by the migration of connective-tissue cells. They differ from spindle cells in that the long axis is drawn out at the ends, and the long axis of the nucleus does not fill out the body, while in the spindle-cell sarcoma the cells are smaller, plumper, only rarely with pointed ends, and the nucleus almost fills out the body.

The distribution of the vessels is also very significant. In benign changes of the endometrium the blood-vessels are few and present distinctive walls, while in sarcoma they are more abundant, and appear in immediate relation to the surrounding tissue of the growth. Amann asserts that the recognition of abundant nuclear division can be employed for the diagnosis of sarcoma.

In the differential diagnosis of subinvolution of the decidua and incomplete abortion the clinical history is of advantage; but if long-continued, irregular menstruation is followed by severe hemorrhage, perhaps an offensive discharge, while the uterus remains large and not especially hard, confusion with sarcoma is possible. This will require the microscope for confirmation, and then not always with certainty. The individual decidual cells closely resemble those of sarcoma of the mucous membrane. The retained tissue glands will present the alterations of pregnancy in their epithelium to such a degree that the error is easily avoided. The difficulty will be greater when a retrogression of the decidua has occurred, for the uniform structure of the decidua is destroyed. In single sections, however, individual islands of the decidual structure will be found, while other sections will show a great irregularity in the cells. The size of the cells is quite variable; frequently the decidual cells show a pronounced spindle shape, and penetration of the tissues by round cells exists, so that a structure is formed which is extraordinarily like a sarcoma. Differentiation is easily accomplished in such cases by demonstrating the chorionic villi. If we find the decidual cells by curetment of a woman who has had an abortion months before, we will also find the chorionic villi present, for the decidual cells are not otherwise so long retained. In the absence of the chorionic villi the diagnosis is fixed by finding, near the large decidual cells, sections of tissue which show the unaltered mucous membrane with retained glands or with the recognizable alterations of interstitial endometritis.

Tuberculosis of the endometrium, by the premature loss of the glands, through the appearance of numerous round cells in the tissue and the occurrence of irritation cells, causes confusion with sarcoma. The clinical history, the demonstration of caseation, the peculiar irritation cells of tuberculosis, and the rarely demonstrated tubercle bacilli will protect against confusion.

Carcinoma of the Uterine Body. There are certain forms of cancer which cannot be distinguished microscopically from sarcoma. We can, however, determine that malignancy is present.

As in the mucous sarcoma, the diagnosis is made only by microscopic examination of the discharged or removed pieces of the growth. Greater difficulties are experienced in securing the material for study than in the latter. A suspicion that fibrosarcoma exists should be awakened:

First, if a myomatous tumor does not cease to grow after the menopause. Rapid growth does not always follow sarcomatous degeneration.

Second, if a woman with a myomatous tumor commences to bleed after the menopause. In rare cases this may occur in advanced age from mucous polypi, but the association of a profuse watery discharge should be held to be very suspicious of sarcoma.

Third, if with a myomatous tumor cachexia occurs. Through excessive bleeding myoma causes anemia, but never cachexia.

Fourth, if a myomatous tumor occasions symptoms which are explainable neither by the size nor the situation of the tumor.

Fifth, if ascites complicates the tumor. The possibility of its being caused by other conditions must be excluded. Ascites occurs from penetration of the peritoneum by the disease, and may follow a subserous tumor which has become sarcomatous.

Sixth, if a myoma which was previously hard grows rapidly and becomes soft and swollen.

Seventh, if after the removal of a fibrous polypus another follows.

Recurrence. The tendency of the disease to return seems even greater in the fibrosarcoma than in the mucous growth. It is probable that the explanation of the greater frequency of the occurrence in the former is due to the early recognition and more prompt treatment of the latter.

When a case of mixed sarcoma remains a year free from recurrence it may be considered as cured, but not so the fibrosarcoma, for it has been known to return at a much later date. The great difficulty in the treatment of this, as in all malignant disease, is the impossibility of determining the diagnosis before the disease has extended beyond the point at which it can be removed surely. Results must continue bad until both patient and physician have learned to realize that uterine hemorrhage is a symptom which demands prompt and thorough investigation. When the disease has so extended that a radical procedure is no longer indicated, our efforts should be directed to the arrest of hemorrhage, the decrease of discharge, and the improvement of the general condition of the patient.

Treatment. Whenever possible, the uterus should be extirpated. No other measures are worthy of consideration, but the case must come under observation sufficiently early to admit of the extirpation of the organ within the limits of healthy tissue.

Operation is contra-indicated when the disease has so broken down the system of the patient that she will be unable to endure the ordeal of a radical procedure. It is also contra-indicated when the growth is no longer confined to the uterus. The existence of metastases and the extension of the disease beyond the confines of the uterus would render operation of no avail. This assertion does not apply to extension upon the vagina if the disease can be removed. The existence of ascites must not influence against the procedure unless the involvement of the retroperitoneal glands can be demonstrated. The removal of the entire uterus, even in slight cases, is indicated, because it affords greater immunity against return than any partial operation. When the size of the uterus permits, the operation should be performed by the vagina. This usually can be done in cases of mucous sarcoma, as the organ is rarely of large size. A fibrosarcoma often may be scraped out and the size of the organ reduced by the administration of ergot for a few days, and the vaginal operation performed then. It is unwise to subject the healthy tissues to infection by cutting up the tumor to reduce its size.

333. Treatment Following Operations for Malignant Disease. The after-treatment of such patients will have been greatly simplified by judicious care during and preceding the operation. This care includes thorough sweeping out of the intestinal canal with saline purges, the administration of intestinal antiseptics, as salol or the sulphocarbolates, a restricted diet from which milk has been excluded, the exclusion of every possible means of infection by cleansing the patient, and during the operative procedure the employment of measures to sustain the circulation. Immediately following the operation the patient should be under the care of a conscientious nurse, who will see that she is kept properly covered in a well-ventilated room. Where necessary, the bodily temperature should be maintained by artificial means, such as hot blankets and hot-water bottles. Do not allow this to drift into a routine procedure to be employed regardless of conditions, as, for example, after a difficult operation, upon a very hot day, following the patient to her room, I found her covered with blankets and surrounded with hot bottles; upon taking her temperature it was found to be 104° F. Obviously this patient was getting the opposite of what she should have had. The patient, unless very feeble, should not be confined to one position, but should be permitted to move from side to side. The pulse, temperature, and general appearance of the patient should be watched carefully for danger signals. Where the patient is uncomfortable and unable to evacuate the urine, it may be drawn by catheter, but catheterization should be avoided, where possible, and need not be employed under sixteen hours unless the patient complains of distress. For the general principles of after-treatment the reader is referred to § 150–164, as only details especially referable to operations for malignant disease will be here discussed.

If the abdominal wound is closed, the vaginal tampon of gauze may be permitted to remain for six to nine days. In the third week the patient is permitted to arise, and in the fourth to go about the house. When clamps are used instead of ligatures, the weight and dragging of these instruments increase the pain. The distress is aggravated by every movement, and frequently morphin may be required to make it endurable. The difficulty often is increased as early as the day after the operation by an accumulation of flatus. In the majority of cases the difficulty appears later, and is relieved only after prolonged rectal irrigation. The meteorism, increased abdominal sensibility, enhanced rapidity of pulse, and elevation of temperature produce anxiety, which is aggravated by prolonged vomiting and other signs of ileus. A number of cases are reported of a fatal result from kinking of the intestine. The continuation of such symptoms should lead to removal of the gauze, for fear that it is causing the obstruction. This is done with the recognition of the fact that the adhesions are not firm, and that trouble may arise from its premature removal. The cavity should be tamponed lightly. In the removal of the gauze care must be exercised that a knuckle of intestine is not drawn into the vagina. Such an accident occurred in one of my patients, where the interne withdrew the gauze and found that there was a large coil of intestine in the vagina, which he could not replace. I placed the patient upon her side, with the hips elevated, and had no difficulty in replacing the intestine, which was kept in place by a gauze tampon. As to how long the gauze shall remain, operators differ—from the one or two days of Doyen to the ten days of Zweifel. The latter prefers the longer period because the earlier removal of the gauze breaks up the adhesions and draws down the intestines; at the later period the gauze has become loosened and the intestinal adhesions are so firm that they are undisturbed.

The clamps are generally removed at the end of forty-eight hours. Landau and Seligman remove them on the second day. I have had several cases of severe hemorrhage after removal at the end of forty-eight hours—hemorrhage which is difficult to control. Its occurrence requires resort to exposure of the cavity by retractors, and the ligament must be followed up and the bleeding vessels again secured with forceps.

Another objection to the use of clamps is the danger of injury to the ureter and the bladder, but this is due to want of care in pushing away these organs, and is just as likely to occur from careless use of the ligature.

Injuries of the rectum are also reported, but are less excusable than those of the urinary apparatus. Among the causes of fatal result sepsis is the most frequent.

FALLOPIAN TUBES.

334. **Benign tumors or growths of the Fallopian tubes** are exceedingly rare, except as a result of inflammatory disturbance.

Fibroma or myoma is infrequent and of small size. It develops from the muscular tissue of the tube, and may grow inward or become subperitoneal, but rarely obstructs the tube lumen. Inflammatory and tuberculous alterations have been mistaken for myoma, particularly the condition known as salpingitis nodosa. Under the name of adenomyoma or cystadenoma Recklinghausen describes a peculiar form of myoma which occurs only in the uterus and tube. It is characterized by the usual constituents of the fibroid, which include glandular structure. In the tube he attributes it to some remains of the primordial structure—the Wolffian body.

Fibrocyst, a unique new formation, is described by Sänger-Barth. It consists of three tumors collected from a conglomeration of various large cysts and firm tumors that were in part pedunculated from the fimbria of an otherwise healthy tube. Microscopically, the wall of the cyst consisted of fibrous connective tissue with smooth muscle-fiber, and within a nest of embryonic tissue. Its surface was covered with ciliated epithelium, and the contents of the cyst were detritus. The principal mass of firm tissue partly consisted of gelatinous myxomatous and partly of loose cell tissue. The products greatly resembled a teratoma.

Enchondromata are small, semitransparent, cartilaginous masses, which are occasionally situated upon the ends of the fimbriæ.

Dermoid of the tube is exceedingly rare. Ritchie describes a plum-sized bone removed from a dermoid of the tube. Pozzi, in a recent edition of his work, presents a diagram of a dermoid cyst removed from the tubal wall, which was adherent to the ovary. It had developed within the tube and ulcerated through the overlying wall.

Cysts of small size are frequent, though their true cystic character is denied. The large irregular bullæ so common in association with fibroid growths are said to be dilated lymph-spaces. Cysts varying from the size of a pea to that of a walnut are found in all the walls of the tube, but most frequently beneath the peritoneum. Cysts within the tube are not infrequently the result of inflammatory changes by which the adjoining folds of the mucous membrane become adherent. Cysts of the tubal fimbriæ become pedunculated and resemble the hydatid of Morgagni, which is by some regarded as a cyst. The cysts contain clear serum, colloid masses, or chalky bodies. Sänger divides these cysts into:

1. Serous cysts, which arise by the accumulation of serous fluid between the lamellæ of the new mucous membrane. They can attain the size of a child's head, and may be either single or double.

2. Lymphangiectasis and lymphangiectatic cysts in three forms:

(*a*) As small vesicles upon tube and ligament, identical with those of older authors; (*b*) winding, ramifying tubes with constrictions and cystic distentions; (*c*) lymphangiectatic cysts—large, tough-walled, isolated cysts in the tubal serous covering or the mesosalpinx. The two latter occur especially with uterine myoma.

3. The hydatid of Morgagni, regarded as a physiologic cyst of the end of a tubal fimbria.

Inflammatory cysts of the tubes—known, from the character of their contents, as hydrosalpinx, pyosalpinx, and hematosalpinx—have been discussed under inflammation. (§247.)

Polypus is a rarely recognized growth. Lewers reports a case in which, upon the inner surface of each dilated tube, were numerous growths varying in size from a pin's head to a pea. Amann speaks of a growth of the mucous membrane consisting of connective tissue covered with enormously folded cylindric epithelium. Rokitansky and Klob describe connective-tissue growths of the fimbriæ.

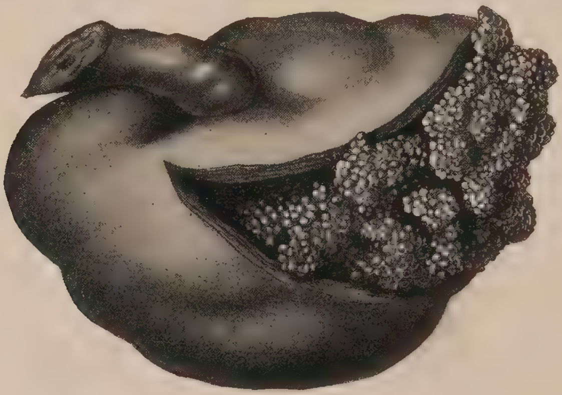


FIG. 551.—Papilloma of the Fallopian Tube.

Papillomata, denominated by Sutton as adenomata, are allied to the condylomata, or warts, found upon the vulva. The villus consists mainly of epithelium. Sänger has collected six cases, and divides them into two forms: (1) Simple cystic; (2) hydropic.

The simple cystic is an indefinite soft growth from the mucous membrane, of a cauliflower-like appearance (Fig. 551), and its villous structure may fill out the tube and distend it into a considerable sized tumor.

In the second form (cystic and vesicular papillomata) the tubal end becomes closed and the villi are so swollen as to give the appearance of a cystic mole. This form differs from the first in the greater size of the cavity, from the inner surface of which spring the papillary masses. Doran and Sutton have attributed the occurrence of papillomata to previous gonorrhea, but with such a cause they should occur more frequently. They are difficult to differentiate from sarcoma and cancer. Their benignity, however, is proved by the absence of any tendency of their epithelium to atypic growth, and there are no metastases.

335. Malignant Tumors. *Carcinoma* of the tube may be either primary or secondary, though the latter is the more frequent. Secondary involvement of the tubes from cancer of either the ovaries or the uterus is comparatively late, as we frequently find the ovary forming a large tumor from cancer or sarcoma without any involvement of the tube. Doran divides primary cancer of the tube into two forms:

1. When the cancer develops in the mucous membrane of a normally formed tube.
2. When it forms in a malformed tube bearing a cyst whose wall becomes infected.

In the first form its situation shows its origin in the papillary structure—whether from degeneration of papilloma, as believed by Doran, or directly from the tubal mucous membrane, as asserted by Sänger-Barth, remains to be determined. The occurrence of the disease in the middle and external portions of the tube indicates that it is a sequel of inflammatory trouble.

In the second form the disease develops in a cyst of the ostium. Doran describes a specimen in which the end of the right tube was dilated for an inch and a half, was very tortuous, and formed a tumor an inch in diameter at its widest part. In its wall was a solid deposit, over a quarter of an inch in thickness. At its outer part it communicated with a thin-walled cyst, situated in the anterior part of the broad ligament, lifted up its anterior fold, and raised the serous coat of the uterus. The cyst was about six inches in diameter, and its interior contained a thick deposit which appeared encephaloid in character. Under the microscope the stroma was scanty, with wide alveoli containing great masses of cubic epithelial cells, as in encephaloid cancer.

Amann is inclined to believe that cancer of the tube will prove to have developed through metastases from the uterus. Taussig reports a case of cancer of the cervix in which a metastasis to the tube had occurred without any intermediate movement. The disease is generally confined to one tube. The recognition of its existence is necessarily difficult. When, after previous pelvic inflammation, a patient who has reached her forty-fifth year shows a sudden or steady growth of subjective and objective symptoms, cancer, says Doran, may be suspected, and watery or sanious discharges greatly increase the suspicion of malignancy.

Treatment should consist in the prompt removal of all infected structures.

Sarcoma of the ovary is frequent; of the tube, very rare. Occasionally, the sarcomatous nodules are found scattered over the peritoneal surface of the tube, but the disease more frequently passes from the ovary to the omentum. Kahlden reports a case in a woman of fifty-one years, in which the tube formed a sausage-shaped mass filled with soft, cauliflower-like material. Under the microscope it showed various degenerations, such as round-cell and spindle-cell sarcoma, and a papillary structure wanting in connective tissue. These formations were found to arise from the endothelium of the lymph-vessels, which was increased several layers. As important constituents could be shown irritation cells similar to those in sarcoma.

Chorio-epithelioma Malignum. Just as malignant degeneration can occur in a portion of placenta or chorion which is retained in the uterus and produce a large tumor and subsequent metastatic deposits in the abdominal and thoracic viscera, a similar malignant change may follow an ectopic gestation in the tubal sac. Sänger advances this as an additional argument for active interference in such cases, and for the extirpation of tubal moles and of the appendages when tubal abortion has occurred.

THE BROAD LIGAMENT.

336. **Cysts of the broad ligament** varying in size from a pea to a pigeon's egg are frequent, and generally of little clinical interest. They may be situated upon the surface of the ligament or may lie deeply within its folds. Their walls are thin and the contents of the cyst consist of a watery or pale colored fluid. Superficial cysts are of undetermined origin, while the deeper growths are attributed to changes in the parovarium. I recently removed a multilocular cyst from the anterior surface of the broad ligament by opening the overlying peritoneum and enucleating the cyst. The ovary was not affected and was left undisturbed. These cysts are frequently pedunculated, but rarely attain to any great size. They are generally called microcysts, and often are developed in the structure or suspended from the organ of Rosenmüller. Only those which develop from the vertical tubes of the parovarium have ciliated epithelium and are liable to form papillary growths subsequently.

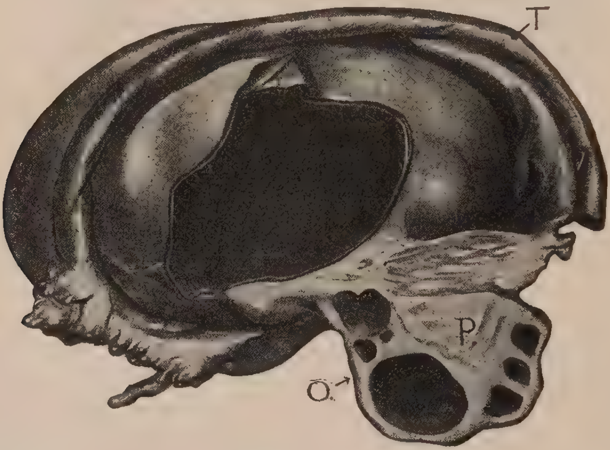


Fig. 552.—Broad Ligament Cyst.
T. Fallopian Tube. P. Parovarium. O. Ovary.

Parovarian Cysts. (§342.)

Echinococcus cysts are rare, except in certain districts, notably Iceland

and Mecklenburg. In the majority of cases they occur primarily in the pelvic connective tissue, and always near the intestine. In rare instances the ovary proves to be the primary seat of the disease. The wandering of the parasite causes a chronic inflammation, characterized by round, elastic tumors situated near the rectum, which are slightly movable, but not painful. Bimanual palpation reveals that they are not connected with the uterus or ovaries. A positive diagnosis is to be determined only by a careful examination of the fluid obtained from the cysts, either by spontaneous rupture or by puncture. The danger of infection from it is so great that the certain determination of the disorder will not compensate for the increased peril induced by the puncture.

Treatment. The proper plan of treatment consists, when possible, in the removal of the sac. If we are unable to remove the cyst completely, it should be fastened to the abdominal wall and drained. Pozzi advocates, when we have had to open the peritoneal cavity, that the opening over the cyst should be packed with iodoform gauze for twenty-four to forty-eight hours, until adhesions have formed, before the cyst is opened. It can be done then without danger of infecting the peritoneal cavity. If the tumor is situated low in the pelvis, a vaginal incision should be preferred. The sac cavity should be emptied and packed with gauze.

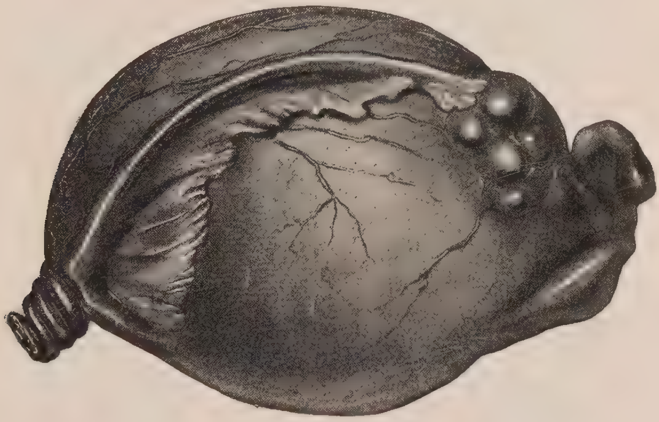


FIG. 553.—Broad Ligament Cyst, with Torsion of Its Pedicle.

Parovarian Varicocele; Phleboliths. A varicose dilatation of the veins of the pelvis is common, and frequently, according to Klob, results in the formation of phleboliths. Their frequent occurrence is attributed to the unusual existence of valves in the veins of the broad ligament. These masses attain the size of a pea or bean, and occasionally cause inflammation and thrombus formation. When situated so that they can be palpated through the vagina, they are often mistaken for ureteral calculi.

Lipomata. Small collections of fat are not infrequently found in the mesosalpinx of the broad ligament near the under surface of the tube. They can attain the size of a bean, occasionally the size of a walnut.

Fibroma. As the same muscular structure is found in the broad ligament as in the uterus, it is not surprising that occasionally fibroids should be found in the ligament independent of the uterus and its structure. Such growths may spring from the round ligament or are found in the broad ligament. The latter have been considered as aberrant uterine fibroids which have become separated from their first attachment. Sänger found these growths most frequently upon the right side. They may be situated intraperitoneally, in the fold of the groin, or in the labium majus. The mass may have a pedicle or may be sessile. It does not attain a large size, is quite movable, and is not painful. The condition may be confounded with fatty hernia, an epiplocele, or an ovarian hernia. The fatty hernia is frequently reducible, painful to the touch, quite soft, and ill defined. The irreducible epiplocele becomes like a fibroid, but has a cord stretched behind the abdominal wall. In an ovarian hernia the tumor retains the shape of the organ, is exceedingly sensitive, and increases at each menstrual period, while the uterus is displaced to one side. The treatment is extirpation.

337. **Malignant Growths.** Carcinoma and sarcoma of the broad ligaments are usually the result of extension of the disease from the uterus or ovaries. The rectum, the bladder, or the retroperitoneal glands may be the source of the infection.

OVARIAN TUMORS.

338. **Ovarian Tumors**. *Characteristics.* Tumors of the ovaries differ from neoplasms of the other portions of the genital tract in their greater propensity to malignant degeneration, often rendering it difficult to determine whether an individual growth is malignant or benign. For this reason we will depart from the custom we have followed previously and discuss the two classes of tumors together.

Classification. The tumors of the ovary are divided:

- Clinically
  - Cystic
    - Simple.
    - Proliferating.
    - Dermoid.
  - Solid
    - Fibromata.
    - Sarcomata.
    - Carcinomata.
    - Endotheliomata.
- Pathologically
  - Simple.
  - Proliferating.
  - Dermoid.
  - Parovarian.
- According to size
  - Small.
  - Large.

Cysts may originate in any part of the tubo-ovarian structure, as the cortical, medullary, or parenchymatous portions of the ovary; in the structure between the tube and ovary known as the Rosenmüller organ or parovarian structures; and in the hydatid of Morgagni, the extremity of the canal of Müller. We have already spoken of cysts which develop in the folds of the broad ligament and are recognized as broad ligament cysts. Cystic growths may become of almost unlimited size, larger than any other growth of the body, and occasionally the body may seem but an appendage of the tumor. These growths repeatedly reach a weight of 100 pounds. Maritan reported an ovarian cyst weighing 200 pounds removed from a woman who previously weighed 290. (Fig. 554.) Her girth measure was ninety inches. Bullitt removed a tumor whose sac and contents weighed 245 pounds, and Spohn, of Texas, one of 328 pounds with recovery of the patient.

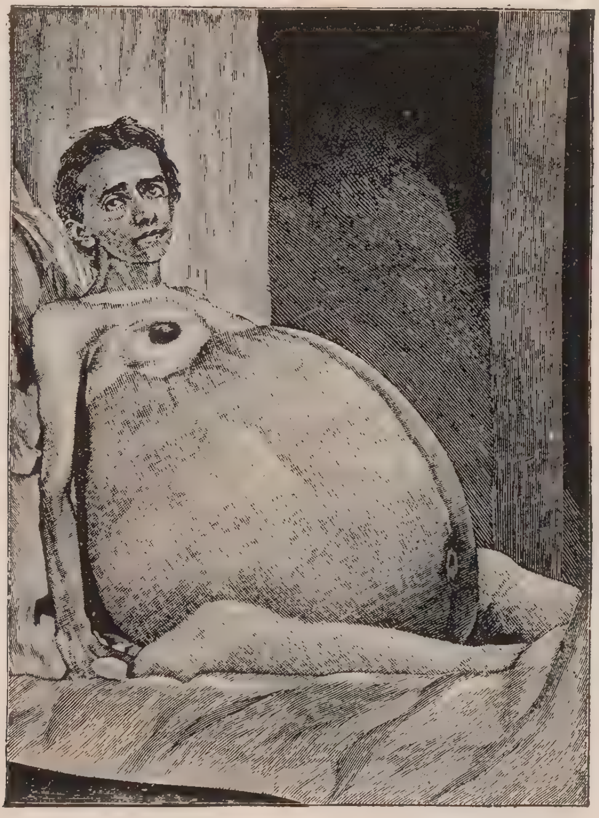


FIG. 554.—Large Ovarian Tumor.

Solid tumors are much less frequent than the cystic and closely retain the shape of the ovary. The cystic are irregularly spheric—the more spheric, the larger they become. As a rule, the surface is a bluish-white, greenish, brownish, yellow, or a glistening white. Secondary developments may occur in the wall, giving it an irregular shape, or it may consist of a large number of small cysts, which give the impression of a solid tumor.

Cysts are still further divided into unilocular or single cysts, and multilocular, where the sac is composed of a number of cavities or smaller cysts.

Careful examination of a unilocular cyst will frequently show smaller cysts within its walls.

The contents of the various tumors greatly differ; indeed, the different cysts in the same tumor show radically different contents. In the unilocular tumors the contents are usually clear and limpid; in the multilocular, thick, viscid, and glue-like in some, clear and limpid in others, while, from various causes, there may be discoloration by an admixture of blood, pus, or fat.

The broad ligament cysts are generally unilocular and contain a clear fluid; those which originate in the hilum are papillary; and those from the parenchymatous structure of the ovary, glandular.

The small cysts comprise:

- Small residual cysts.
- Follicular cysts.
- Cysts of the corpus luteum.
- Tubo-ovarian cysts.

The large cysts are:

- Glandular proliferous.
- Papillary proliferous.
- Dermoid.
- Parovarian.
    - Hyaline.
    - Papillary.
    - Dermoid.

Small residual cysts are growths which develop in the structure between the tube and ovary, known as the parovarian structure, or the organ of Rosenmüller. Those which develop in the vertical tubes have ciliated epithelium, and may develop subsequently into papillary growths. They may become detached from the ligament and hang from the peritoneal surface by a slender pedicle. It is possible that from these cysts may originate large cysts filled with either fluid or papillary contents.

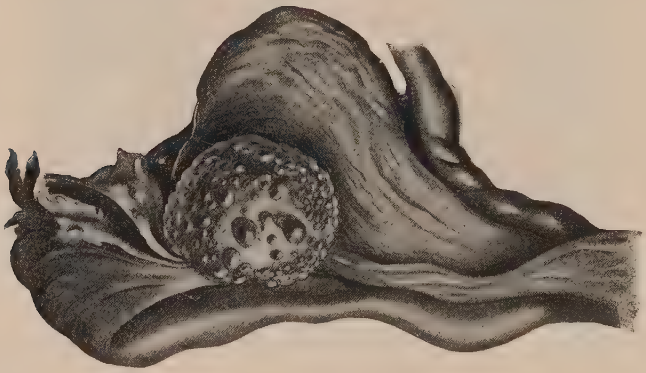


FIG. 555.—Small Residual Cysts.

Attached to the fimbriated end of the tube generally is found a small cyst, varying in size from a pea to a cherry, known as the hydatid of

Morgagni, which, from its almost continuous presence, is regarded as a physiologic cyst. This hydatid is the termination of the duct of Müller. It is transparent, has a thin wall, and has a pedicle often a full inch in length. Doran describes a supratubal cyst of similar size, appearance, and structure, which he supposes to be a microcyst of the broad ligament in this anomalous position.

Simple or Follicular Cysts; Hydrops Folliculorum. These cysts are unilocular dilated follicles, generally multiple and small. In an ovary that has not attained to twice its normal size fifteen to twenty of these cysts may be found. When small, the ovary is but slightly enlarged and the follicle projects upon the surface or lies embedded in the stroma. These cysts were long considered the sole source of large ovarian cysts, but it is only in rare instances that they attain the size of a fist, occasionally of a man's head. The contents of the cyst are generally clear, but may be blood-stained, and have a specific gravity of from 1005 to 1020. The cyst-wall is a transparent, thin membrane of a light gray color, covered with columnar epithelium. The cysts may be few and the stroma excessive, or the former may be very numerous and the latter scanty. When the latter condition is present, the ovary is frequently converted into a mass of delicate cysts. It is not unusual to find an otherwise

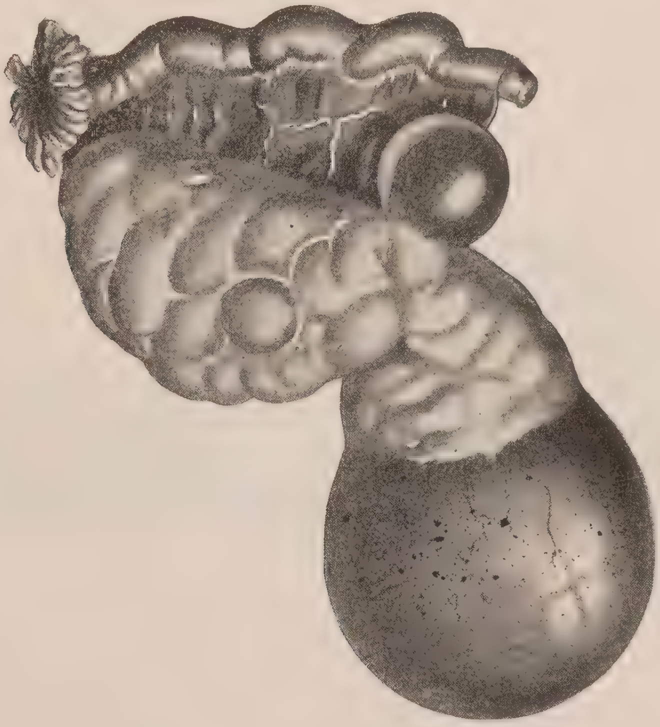


FIG. 556.—Cyst of the Corpus Luteum.

healthy ovary containing a unilocular cyst the size of a hen's egg. The disease is generally bilateral.

Etiology. These cysts, even when large, are regarded as unruptured and dilated Graafian follicles, because of the gradations observed between them and the smaller cysts. In the smaller ones ovula may be detected, which have been destroyed or have escaped observation in the larger. Failure to rupture and increase of the fluid contents produce a dropsy of the follicle. The normal rupture may be prevented by undue thickness or toughness of the walls, the result of inflammation; by deposits of exudation over the surface of the ovary; or by the deep situation of the developing follicle; or failure may be the result of too slight congestion, which, though increasing the secretion, is too gradual to produce rupture. Such cysts have preceded menstruation, being occasionally found in the fetal ovary. As these cysts are generally associated with chronic oöphoritis and thickened tunica albuginea, they are generally associated with sterility, excessive menstruation and pain preceding the menstrual flow from ten days to two weeks.

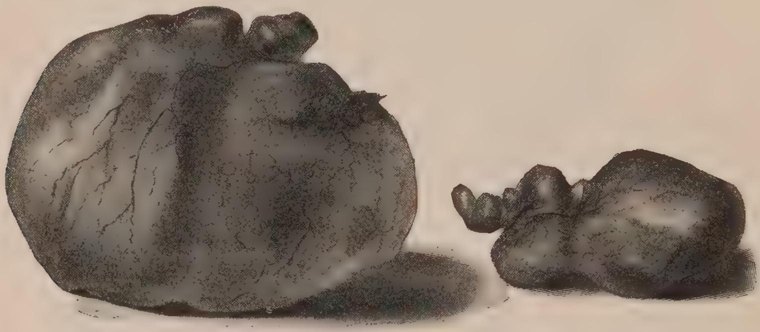


FIG. 557.—Tubo-ovarian Cysts.

Cysts of the Corpus Luteum. These are unilocular cysts the size of a pigeon's egg, occasionally as large as an apple. They were first described by Rokitansky, who believed that only the corpus luteum of pregnancy could be thus transformed, but such cysts have been found in nulliparæ. (Fig. 556.) The cyst-wall is comparatively thick, lined by a yellow, apparently folded membrane, in which microscopic examination shows the bud-like papillæ characteristic of the corpus luteum. The recognition of this structure prevents their confusion with follicular cysts, or even with suppurative ovaritis.

Tubo-ovarian Cysts. An ovarian cyst in contact with a distended tube not infrequently results in the formation of a tubo-ovarian cyst. (Fig. 557.) The tubal inflammation early causes the formation of extensive adhesions fixing the tubal ostium to the ovary. The increasing pressure of the accumulating fluid gradually absorbs the thin septum until the two sacs form one cavity, the smaller portion of which usually is formed by the tube. It does not generally attain a large size. The uterine end of the tube may remain permeable, and, as the fluid increases, permits the excess to drain through the uterus, forming a condition known as profluent tubo-ovarian hydrops. It resembles the condition engendered in hydrosalpinx, known as *hydrops tubæ profluens*. The open tube acts as a safety-valve, preventing the increase and overdistention of the cyst, frequently leading to its complete collapse after every evacuation.

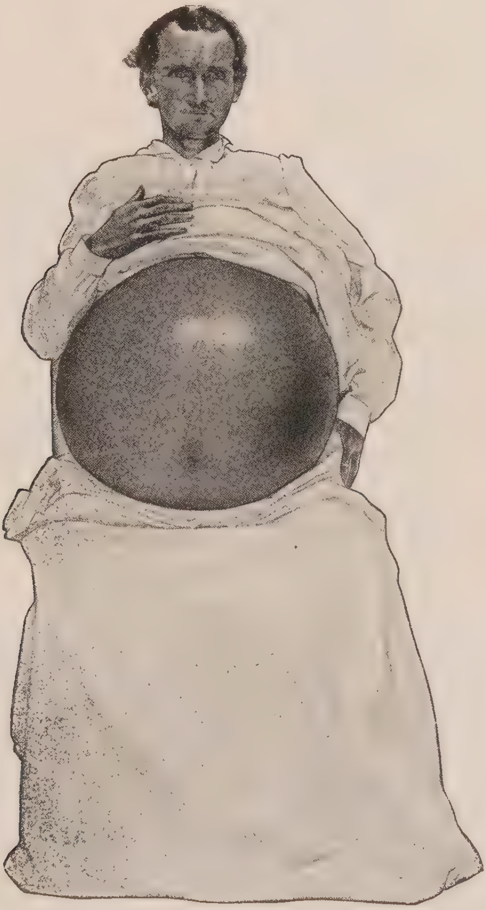


FIG. 558.—Large Ovarian Cyst. Patient Upright.

339. Glandular Proliferating Cyst. This class of cysts comprises the great majority of ovarian tumors, and they vary from the size of an egg to that of a tumor weighing over two hundred pounds, which may fill up the entire abdomen and encroach upon the thoracic viscera. The surface of the cyst presents a pearly-white, glistening appearance, the thinner portions of which are purple, green, or black, according to the color of their individual contents. The external surface may be smooth, oily, and covered with papillary growths or mucous vegetations. (Figs. 558 and 559.)

The term *proliferous* is applied to those which are highly organized and abundantly supplied with blood-vessels. The term *proligerous* is given to cysts that have the faculty of budding or generating new cysts from or within the original growth. They may be spheric in shape and regular in outline, simulating a single cyst, or may be irregular from the numerous nodules, indicating the presence of a multilocular tumor. These growths generally have a distinct pedicle.

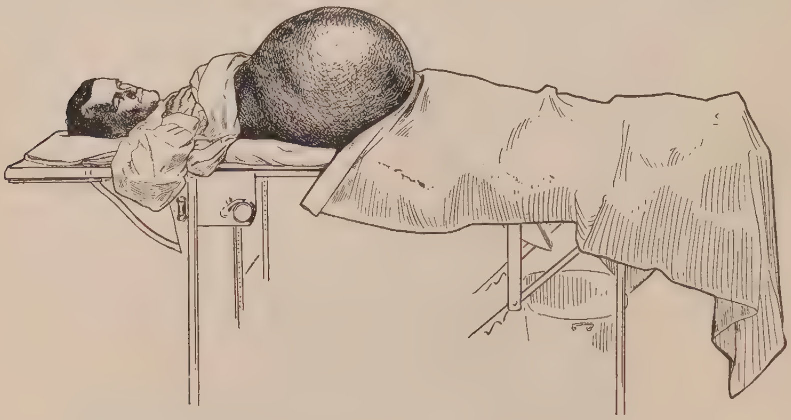


FIG. 559.—Ovarian Cyst. Patient Recumbent.

The attachment of the tumor may be pedunculated or sessile. The latter are frequently intraligamentary. The pedicle may be long or short, thin and band-like, or broad and thick. It is developed by the traction of the tumor and the resulting hyperplasia of the ovarian ligament, and by stretching of the meso-ovarium, of the side of the broad ligament, and of the suspensory ligament of the ovary. The tube generally remains

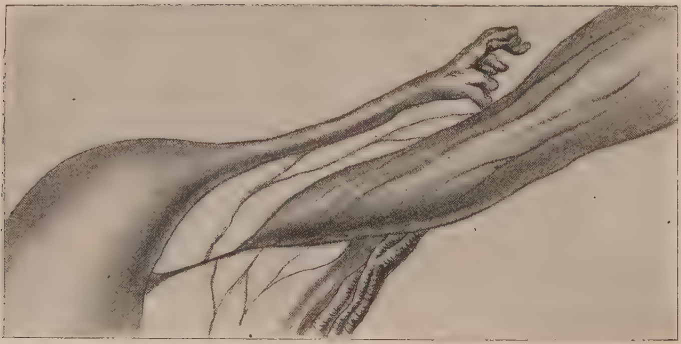


FIG. 560.—Pedicle of an Ovarian Cyst.

separated from the tumor by its mesosalpinx, though the ampulla is often fastened to or approaches the tumor, because of the strongly drawn infundibular ovarian ligament, and the tube usually is elongated. In ovariotomy the tube generally is removed with the pedicle. After the removal of the tumor the cut surface presents a triangular appearance, in which the angles are pointed or blunt, small or large, and formed by the stump of the ovarian ligament, the transverse section of the tube, and the stump of the spermatic artery. The pedicle consists of smooth muscle-fibers, connective tissue, and hypertrophied blood-vessels.

The pedicle varies in length from four to twenty centimeters; in breadth, from two to twelve centimeters; and may be entirely absent

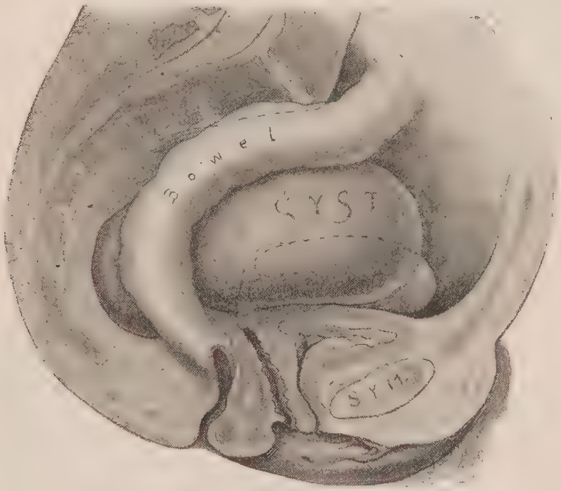


Fig. 561.—Intraligamentary Ovarian Cyst.

The difference in the development of the pedicle is due, in part, to the insertion of the ovary upon the posterior surface of the broad ligament, and partly to the origin and growth of the tumor.

With the ovary originally embedded in the ligament, the development of the cyst in its external part will result in the formation of a pedicle; but the growth of the cyst toward the hilum may result in the spreading-out of the broad ligament and the formation of a subserous cyst. A cyst growing outward through the ligament may cause it to split and form two pedicles. As a tumor develops inward in an embedded ovary and spreads out the ligament, the uterus is pushed to one side, and the tumor fills up the side of the pelvis, to displace the pelvic organs in general. Such a tumor becomes firmly fixed in the pelvis, pushes the peritoneum from the uterus, invades the space between it and the bladder or rectum, and frequently partly spreads out the uterus upon its surface. Such growths are known as intraligamentary cysts. The cyst may be only partly subserous, having spread out the anterior wall of the broad ligament in advance of it, so that the inferior surface of the tumor is uncovered by the serous membrane. The separation of the posterior leaflet in such a growth reveals a long pedicle formed by the anterior fold. As an ovarian tumor develops, its increasing weight carries it backward into the retro-uterine pouch. It is rarely found in front of the uterus. The subsequent development causes it to fill the pelvis gradually until its size no longer permits it to remain below the brim, when it rises into the abdomen. With the change of position there is a partial rotation of the pedicle, which is without clinical significance unless it exceeds a quarter of a circle. Occasionally, the withdrawal from the pelvis is retarded by a marked projection of the promontory of the sacrum, a roomy pelvis, or extensive adhesions. Such a tumor as it increases in size compresses the pelvic viscera, forces the uterus and bladder upward, and may dissect downward until it protrudes at the vagina. In a case under my observation, it was covered only by the posterior vaginal wall.

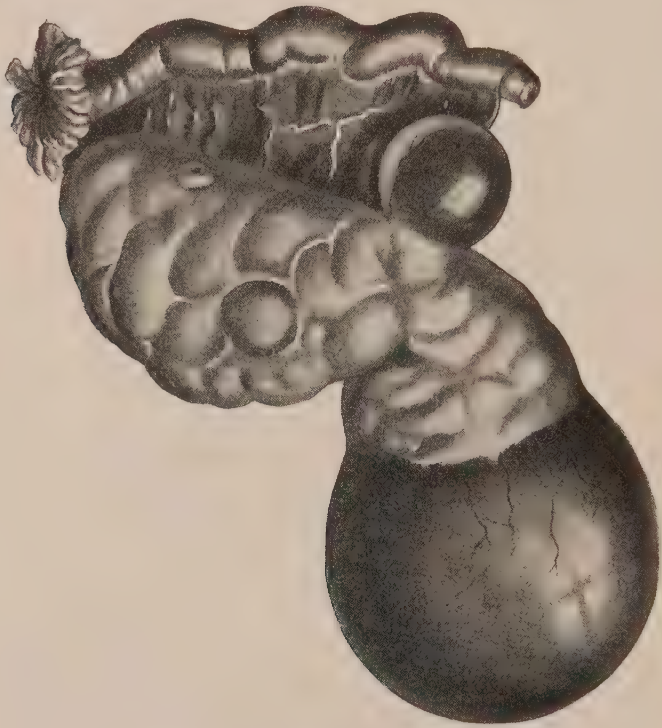


FIG. 562.—Positions of ovary which favor pedunculation, absence and intraligamentary growth.

The nonpedunculated tumor, as it progresses, becomes limited by the lateral walls of the pelvis, after it has spread out the structure and come in contact with the parametrium. In its further growth it is pushed upward and to the opposite side, carrying the uterus. These changes frequently displace the sigmoid portion of the colon, placing it above and in front of the tumor. The intestine is frequently compressed, but not sufficiently to close its canal, and the large vessels are often obstructed.

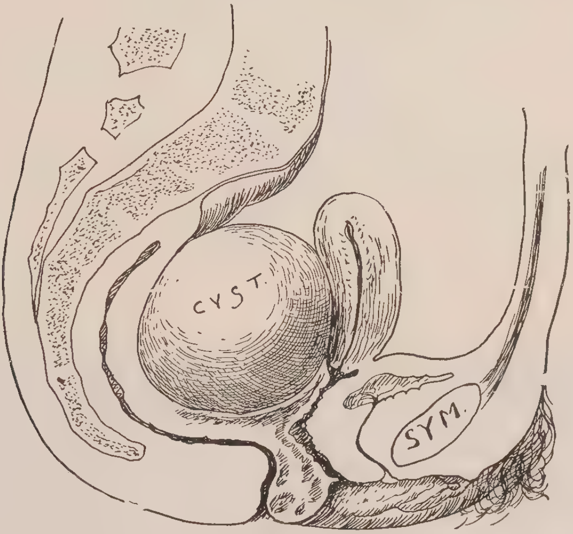


FIG. 563.—Cyst Embedded in the Pelvis.

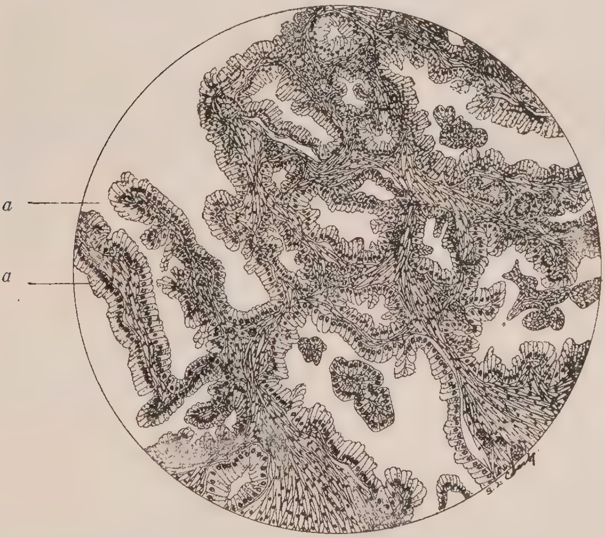


FIG. 564.—Adenocystoma of Ovary, Showing Papillary Formation.
a, a. Papillary projections.

The presence or absence of the pedicle depends somewhat upon the variety of the cyst. The glandular incline to a long pedicle, the papillary to a short or absent pedicle, and the dermoid to a short, strong pedicle.

Structure. The consideration of the internal structure of the glandular cysts justifies their division into areolar, unilocular, and multilocular. These glandular cysts, according to Virchow, originate in an invagination of the proliferating ovarian epithelium into the stroma. Further invagination and proliferation of the tissue result in the formation of new gland tubes, from which new cysts form. (Fig. 564.) The continuation of these processes results in the formation of the many-chambered glandular or adenomatous cyst. Mary A. Dixon-Jones attributes ovarian growths to inflammation through which the tissues become embryonal and new-growths follow.

Areolar Cyst. A conglomeration of small cysts with a thick, well-developed, and vascular stroma is known as an areolar ovarian cyst. A number of these cysts may have ruptured to form a considerable sized one, or the tumor may consist of a very large number of small masses, none of which will exceed the size of a plum. (Fig. 565.)

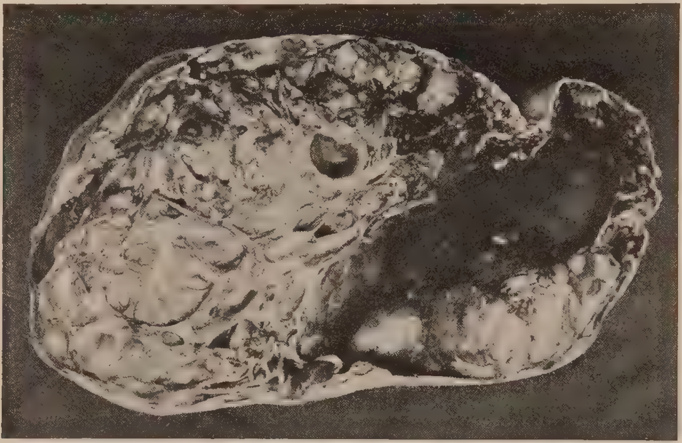


FIG. 565.—Areolar Ovarian Cyst.

Unilocular cysts often attain an enormous size, but examination discloses evidences of their previous division into numerous smaller cysts, so that we can safely assert that all unilocular cysts have originated from the multilocular. The investigation of a large cyst usually will show the presence of small cysts in its walls, and not infrequently the remains of septa within its cavity.

Multilocular cysts contain a number of cysts of varying size, so arranged as to present the appearance of a single tumor. As these individual sacs increase, their intervening walls gradually become thinned, until, one after another, they rupture and the sacs coalesce to form larger single chambers. Not infrequently the circumference of the septa remains, to become still more stretched as the tumor grows, until it forms a cord-like thickening upon the inner surface. Occasionally, the vascular structure alone remains to indicate the former septum. In sudden rupture the vessels of the septa are torn, producing extensive hemorrhage into the sac, which changes the character of the cyst-contents.

In the principal cyst we usually find a wall of three layers, the outside consisting of pure connective tissue, like the albuginea of the ovary. The middle layer consists of loose connective tissue with numerous large vessels, while the inner layer is rich in cells and contains numerous small vessels.

The external surface of the cyst is covered with columnar epithelium, which differs from the pavement epithelium of the peritoneum. The cysts are lined with a one-layered cylindric epithelium, which presents different forms in different tumors, and by its structure governs the character of the secretion in the various sacs. It is only in the smaller sacs, however, that the true similarity of the epithelium and secretion is observed. In the larger cysts the epithelium undergoes degenerative changes; is flattened by pressure; suffers disturbances of nutrition through thinning of the septal wall; and undergoes fatty or albuminous changes, which cause the epithelium entirely to disappear from the wall of the larger cysts. Epithelial sprouts may remain upon the wall, forming new-growths.

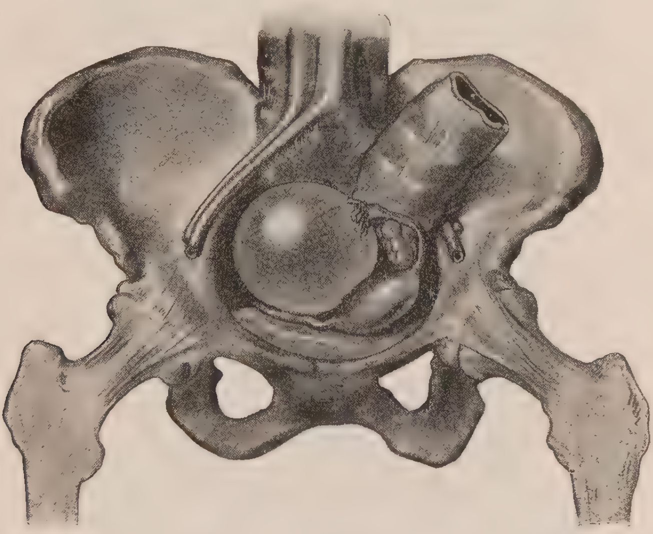


FIG. 566.—Unilocular Cyst.

Pfannenstiel directs attention to the possibility of the formation of papillary growths in the adenomatous cysts. This formation is of great variety, and is found inside as well as upon the surface of the tumor. Sometimes these growths are but sparsely distributed upon the inner surface of a large cyst; in others they appear as circumscribed tufts upon one side, while the remaining portion is smooth; or, again, the entire cavity may be filled with strong, branching growths, while the quantity of fluid is scanty. The larger the cyst, the greater the probability that a large portion of the wall is smooth. As a rule, the papillæ are most marked upon the side of the cyst toward the hilum, while the peripheral side will be scantily involved, if at all.

A great variety in the quality of these vegetations exists. At times only small wart-like growths, from one to two millimeters high, are scattered over the surface, together giving a velvety or grater-like appearance; at others, branching growths of various sizes, up to that of an apple, which may be either broad-based or with a thin pedicle. All the changes are present that are found in the ordinary papillary cyst. The growths appear either as reddish, granulating, cauliflower-like projections, or as sago-sized masses; rarely in the grape-cluster form.

Cyst-contents often present great contrasts in their color and consistency; they may be found almost colorless, straw-colored, milky, green, purple, or black in color; thin or thick, viscid or gelatinous in consistency. The contents of the various cysts in the same tumor will differ in color and consistency. In some the fluid will be thin, and in others so viscid that it will not flow. The fluid in the smaller cysts is more consistent, and becomes thinner as the cysts increase in size, because of changes in the epithelium.

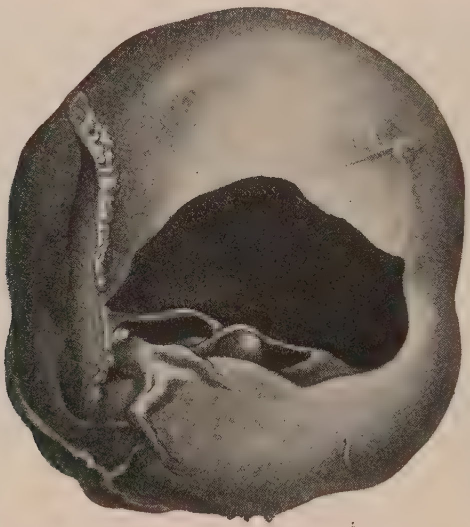


FIG. 567.—Multilocular Cyst.

The specific gravity of the fluid varies from 1002 to 1020, with an average of about 1012. However viscid the fluid, it is found absolutely structureless. Blood-corpuscles, epithelial cells, and crystals of cholesterin are often present. The reaction of the fluid is neutral or alkaline. Upon analysis various forms of albumin, as metalbumin, paralbumin, and albumin-peptone, are found.

340. Papillary Proliferous Cysts. Papillary cysts show a marked proliferation of the connective tissue, which forms itself in tufts upon the inner surface of the tumor, as described above in the complication of the glandular growths. These branching projections may distend the sac to bursting, and these tufts project upon the outside, leading to rapid infection of the general peritoneum. The vegetations spring up luxuriantly over the surface of the ovary, are carried to every part of the peritoneal cavity, and not infrequently, by the action of the diaphragm, are carried to the upper surface of that muscle in the thorax.

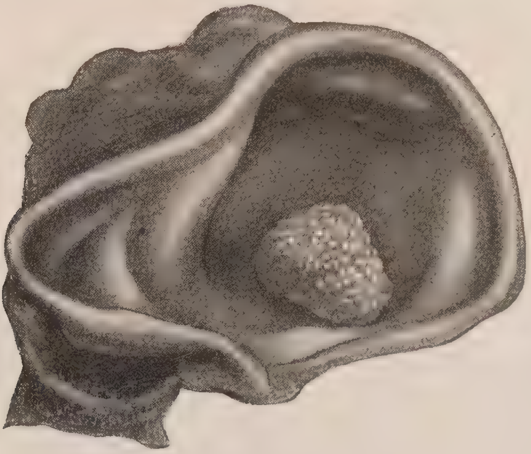


Fig. 568.—Small Papillary Ovarian Cyst.

The contact of this infection with the peritoneum rapidly produces ascites. Similar vegetations may arise spontaneously from the surface of the ovary, and then are known as superficial papillomata. It is probable that these are cases in which a very small cyst has opened and afforded the seed which has infected the external surface. The papillary

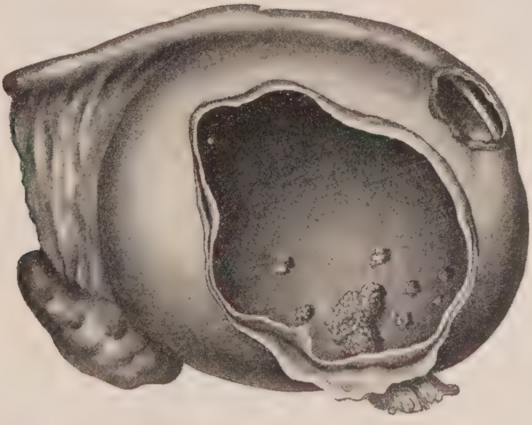


Fig. 569.—Papillary Tufts upon Inner Wall of Cyst.

tumors rarely attain a large size, and are generally bilateral. The dendritic growths project in every direction, are reddish or pearly white and glistening, often three or four inches long, and have the appearance of stems of coral. The masses have usually undergone a partial calcification, so that they break easily and without bleeding.

341. Dermoid cysts are growths in which are found skin and mucous membrane, together with all the structures generally associated with such tissues. The tissues most frequently found are hair, teeth, nails, and sebaceous and sweat-glands. Other structures, occasionally seen, are the mammæ, horn, bone, unstriped muscle-fiber, and rarely, tissue resembling brain. Fat or sebaceous material exists in the largest quantity, often at the temperature of the body in a liquid state. Occasionally, it is found in solid balls. In a patient on whom I operated over two gallons of fatty bodies the size and shape of peas were evacuated. Sutton reports finding over three hundred bodies in one sac. Frequently hair is present in great abundance, and varies in color, length and quantity. It may be blond, brown or black, but the color bears no relation to that of the hair of the individual. Teeth are found in about one-half the cysts; they may be loose, fixed, or buried in the wall. Section through the tooth often reveals it situated in a bony alveolus. Beneath the hard crust of the tooth is found a white or reddish-yellow medullary substance.

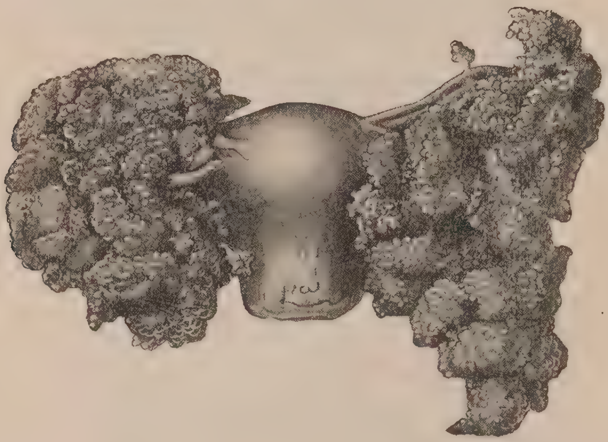


FIG. 570.—Surfaces of Ovaries Infected with Papillary Vegetations.

We may occasionally find incisors, molars, and premolars in the same bone. The number of teeth is often enormous. Schnabel described a case which had three pieces of bone and one hundred teeth. Plouquet found three hundred teeth. Various bones have been described, as the jaw-bone, the petrous portion of the temporal bone, ribs, and the pelvic bones. A finger with articulated phalanges, nail, and nail-fold and an entire skeleton have been recognized. In a double dermoid removed from a girl of eleven years I found a well-formed half of the upper jaw, equipped with teeth, alveolar process, and normal mucous membrane.

Dermoids do not always occur alone, but in conjunction with large glandular cysts, the dermoid forming but a small part of the mass. Sometimes the entire cyst will be found filled with sebaceous material, while careful examination, after washing, shows that the skin covers only a small part of the mass.

Teratoma is a more complex form of tumor which is usually classed with the dermoid. It contains an even more varied structure, and resembles more the solid growths than the cystic. It often attains an enormous size, and contains the various structures of the dermoid and cartilage and a large amount of connective tissue. Dermoid growths may appear at any age. They have been found in children at birth and in women of ninety years.

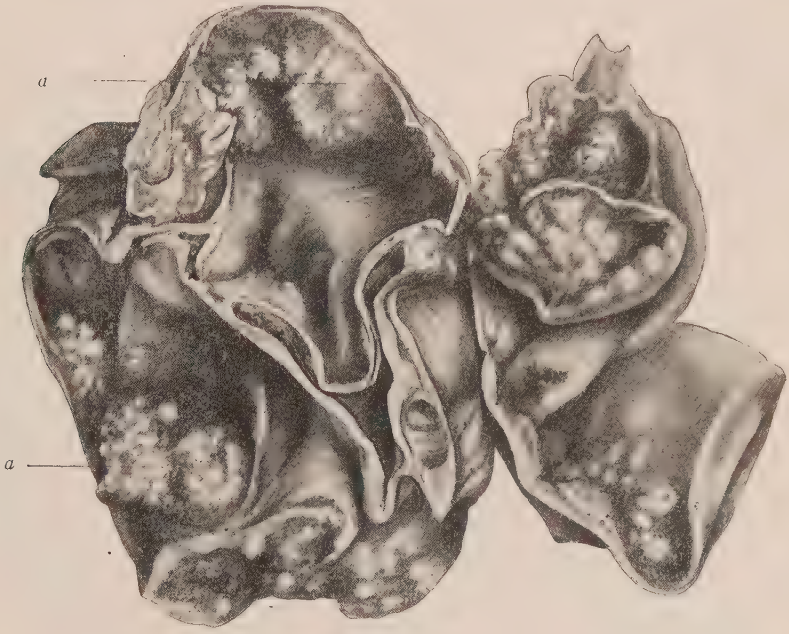


Fig. 571.—Papillary Ovarian Cyst.
a, *a*. Loculi containing papillary growths.

The contents of a dermoid are exceedingly irritating, and every precaution should be practised to prevent the peritoneal cavity from being soiled. I saw a patient in whom an attempted aspiration resulted in drawing out a wisp of hair; the patient at once developed peritonitis, which was fatal in spite of an early operation.

342. Parovarian Cysts. The parovarium is situated in the lateral part of the mesosalpinx, and is the remains of the sexual part of the Wolffian body. It resembles in its arrangement a comb, the back of which is directed toward the tube, while the teeth, some twelve to fifteen in number, converge toward the ovary. They are lined with large cylindric epithelium and terminate in blind extremities. The tumors which originate from this structure are almost always cystic and subserous, and consequently have a double wall. The external peritoneal one is easily separable. The pedicle consists of the tube and of the median ovarian and the suspensory ligaments. Torsion of the pedicle, when long, can easily occur. There are two kinds of cysts which arise from the parovarium, of which the most frequent are the small pedunculated, connected with Kobelt's tubules, which rarely become larger than a pea and are of no clinical significance. The more important are the sessile, which remain between the folds of the broad ligament and burrow into it as they enlarge. These cysts are usually small, though Kummel describes one that weighed forty-two pounds. In the large cysts the tube becomes elongated. The contents of the cyst are clear and limpid, with a specific gravity of 1010 and an alkaline reaction.

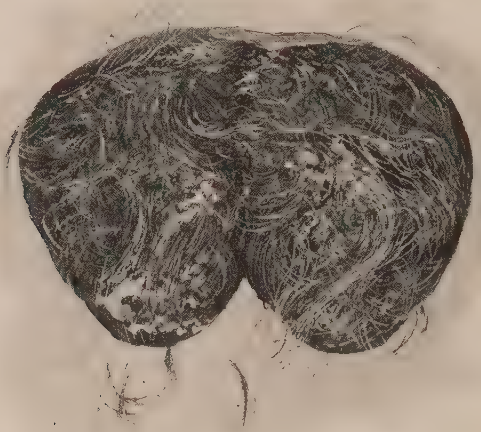


FIG. 572.—Dermoid Ovarian Cyst.

The parovarian and broad ligament cysts form about eleven per cent. of the abdominal tumors of pelvic origin, and both proliferating and dermoid growths have been found in this situation.

These cysts are distinguished from the ovarian, first, by the ease with which the peritoneum can be stripped off; second, because the ovary generally is found attached to the side of the cyst; third, the cyst is unilocular; fourth, the Fallopian tube is stretched over the cyst and never communicates with it; and, lastly, by the gradual thickening of the mesosalpinx.

343. Solid Ovarian Tumors. The solid growths of the ovary comprise five per cent. of the cases that present themselves for operation. These tumors are innocent and malignant, and may become cystic.

Fibromyoma, the benign form, is a rare tumor, but is the most common species of solid ovarian tumor. It closely resembles the uterine fibroma, and frequently is accompanied by ascites. Its growth is slow, and the mass retains the normal shape of the ovary. Adhesions are rare; indeed, owing to the peritoneal fluid, the mobility is increased. Occasionally, we have a growth—the fibroma—in which the minute structure consists of wavy bundles of closely packed fibrous tissue intermixed with small round cells. Williams describes one of these that weighed seven pounds seven ounces; Doran, one of seventeen pounds. The myomatous variety is more frequent, and occasionally undergoes calcareous degeneration, when it may be mistaken for an osseous tumor.

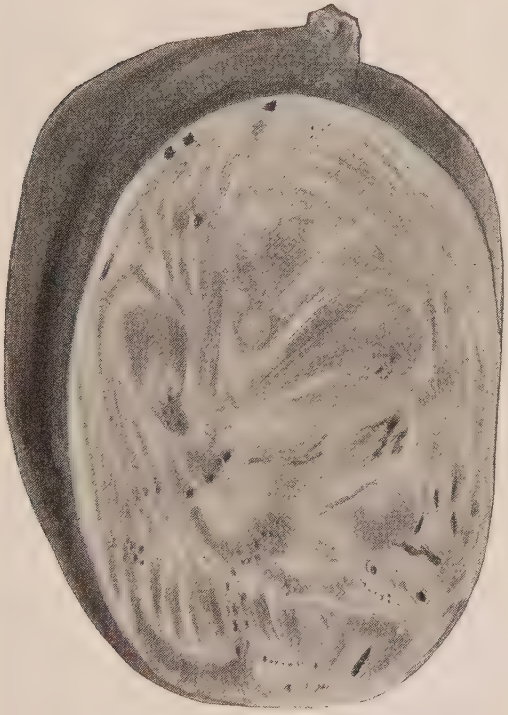


FIG. 573.—Fibromyoma of Ovary.

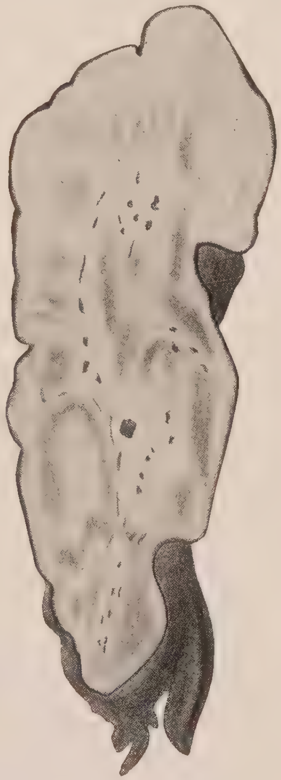


FIG. 574.—Sarcoma of the Ovary.

An apparent hypertrophy, instead of atrophy, of the corpus luteum results in the formation of a growth, occasionally reaching the size of a walnut. Dr. Mary D. Jones pronounces this a *gyroma*, and believes it to be closely connected with the endothelium. It probably develops from the corpus luteum when in the cortex, and from the endothelium in the medulla. Leopold describes a peculiar form of ovarian fibroma containing alveolar spaces packed with epithelioid cells. They are produced by dilatation of the lymphatic and capillary channels and the proliferation of their endothelium.

Sarcoma of the Ovary. Sarcoma resembles the fibroid in form, size, and color, except that its surface is smoother. Its consistence is softer than the fibroid, though it contains much fibrous tissue, which renders the diagnosis at times difficult to determine. Sarcomata occur as round-cell and spindle-cell growths; when the latter predominate, the tumor is more solid and more strongly resembles the fibroma. The muscle-fibers are longer and the nuclei are more slender and rod-like. The round-cell structure is softer, often presenting macroscopically medullary properties similar to those of medullary cancer, and under the microscope are found large layers and nests of round cells, united with irritation cells, and penetrated by numerous blood-vessels of every caliber.

Spindle and round cells are frequently combined, while myxomatous transformation exists in both kinds. Cartilage and bone formation rarely occurs.

Combinations of sarcoma with adenoma are observed in the walls of the larger cysts, sometimes with sarcomatous degeneration of the stroma. In places, large alveoli are separated by vascular connective tissue, which contains large cells undergoing fatty degeneration and resembling carcinoma. This condition Spiegelberg has called sarcoma carcinomatosum.

Carcinoma of the ovary is a more frequent condition than sarcoma. The medullary variety is the most common, and may form a tumor as large as a man's head. The disease occurs primarily, but more frequently as a secondary manifestation.

Endothelioma of the Ovary. Occasionally in the ovary a growth is found which originates from the endothelium of the lymph-spaces or blood-vessels of the organ. It has been previously classed by pathologists with both sarcoma and carcinoma, resembling the sarcoma from its frequent metastasis through the blood-vessels, a carcinoma in consisting of nests of cells with a fine stroma. The growth rarely attains a great size—not larger than an orange or fist—forms a solid tumor, and is a rather firm whitish growth. This same structure frequently is found complicating the glandular proliferating cysts, and gives evidence that many of these tumors, if carefully investigated, would show the presence of malignant conditions.

Etiology. Little is known of the general cause of ovarian tumors. Three theories for their origin have been presented: 1, The Cohnheim theory, which attributed their growth to the retention of embryonic products; 2, the theory advanced by Mary A. Dixon-Jones, that they are always the result of previous attacks of inflammation, and the inflammatory condition of the ovaries produces embryonal tissue from which the growth subsequently developed; and 3, the theory of parthenogenesis, or the development of the nonfecundated ovum as the result of some irritation. The first and second theories are those which have the greatest number of advocates at the present day. According to the first, dermoids are derived from the infolding of the ectoderm in embryonic life, and these cells during subsequent irritation take an active growth and result in the formation of the various tissues found in a dermoid growth.

It is claimed by the advocates of the theory of parthenogenesis that there are some structures found in the dermoid ovary which would require the infolding of all of the layers of the blastoderm in order to complete their development. The advocates of the first theory, however, direct attention to the fact that striated muscle is never found in the dermoid cysts. The character of irritation which sets in motion the development of these growths, whether mechanical or chemic, animate or inanimate, or whether it differs in the various kinds of tumors, is as yet unknown. The frequent occurrence in a cystadenoma of double-sided growth from the covering epithelium favors the belief in a chemic irritation which has proceeded by way of the uterus and tubes. The theory of the parasitic origin of tumors is as yet unproved, though the analogous course of tumor disease with infection has demonstrated that the development of various kinds of tumors in the different tissues of the body from metastatic deposits is of great interest.

The susceptibility to the influence of tumor exciters varies greatly in different individuals; heredity, acquired disposition, age, trauma, scar formation, and inflammation are important factors. Of the influence of heredity little is known, though the occurrence of ovarian cysts in several women of one family is quite frequent. Age has no especial significance, as neoplasms occur in every period of life. Glandular cysts are more frequent between the thirtieth and fiftieth years. All varieties are less frequent in childhood and old age. Fetal tumors are rare, and generally consist of simple follicular cysts. These cysts increase in frequency as the child approaches puberty, probably being induced then by the congestive hyperemia.

Ovarian growths are more frequent in the single than in the married. Scanzoni indicates chlorosis as a predisposing factor, and Fenwick, tuberculosis; but these are difficult to demonstrate.

Natural Progress. Proliferating cysts in the advanced stages grow more rapidly than either the dermoid or solid tumors, unless the latter are malignant. About the early stage of ovarian tumors but little is known, as they are usually well advanced before they come under the observation of the physician. The growth is probably slow. In dermoids and in benign solid tumors the growth throughout is slow. A rapid increase in the size of a growth, noticeable from day to day, is a symptom due to hemorrhage. With the pelvic structures in a normal condition, the cystic ovary drops by its weight into Douglas' pouch, a little to one side of the median line. As it increases it advances in the direction of least resistance, which is upward, and pushes the intestines before it, until it rises out of the pelvis and impinges against the abdominal wall, when it assumes a central position. The pedicle, at first anterior and inferior, is now directly beneath, and often becomes posterior. The tumor lies directly above the uterus, and, resting upon the brim of the pelvis, causes but little inconvenience. Occasionally, the tumor becomes impacted in the pelvis through irregularities in its growth or the formation of extensive adhesions. Sometimes the tumor pushes the broad ligament before it, or, when it develops in the hilum, it will spread out the ligament and become an intraligamentary growth. Once the growth rests upon the pelvis, in its further advance it pushes the intestines upward and laterally. If undisturbed, the enlargement becomes great, the diaphragm is pushed upward, severe pressure symptoms follow, and the action of the heart and lungs is obstructed. The limbs appear as mere appendages to the enormous abdomen. The pressure affects the circulation, respiration, digestion, and the renal secretion. There are marked suffering, emaciation, and the characteristic facial expression known as *facies ovariana.* The presence of ovarian tumors does not interfere with ovulation and menstruation, even though both ovaries are involved, so long as any portion of the ovarian stroma remains undestroyed. Thornton reports a case of pregnancy with bilateral dermoid disease. In solid tumors amenorrhea is due to the total destruction of the Graafian follicles.

Symptoms. In their early stages ovarian tumors rarely produce any symptoms. Movable tumors generally come first to observation when they rise out of the pelvis. An apple-sized tumor, though movable, occasionally will cause unpleasant symptoms, such as pain in the sacrum, which extends down the leg.

Intraligamentary tumors or those prevented by adhesions from rising produce symptoms as soon as they fill the pelvis, especially by obstruction to defecation and micturition. As the tumor increases, the sensations of pressure and unpleasantness are aggravated. Besides the effects given in the description of the progress, the skin becomes stretched, forms striæ, and swelling of the navel and hernia occur. More rarely, from the pressure upon the great vessels, there are edema and varicosities in the legs, sexual apparatus, and skin of the abdomen.

Albuminuria is present, and diminution of the urine from compression of the renal veins is observed. This disappears with the removal of the pressure. Severe compression symptoms from the presence of very large tumors are rarely seen now.

Uterine or vaginal prolapse sometimes complicates the condition, but more frequently ascites and fluid collections follow the rupture of a cyst.

Menstruation usually is unaffected, and sometimes continues regular when subsequent microscopic investigation has failed to show any functionally capable structure. Menstruation disappears comparatively early in those cases in which the follicles perish from the development of sarcoma or carcinoma, and in the papillary cystadenoma, when bilateral. In contrast to fibroid tumor, the menstruation decreases, and a disposition to the menopause is betrayed, not from absent ovulation, but as the result of constitutional conditions. Amenorrhea may exist for several years and menstruation may return after the removal of an ovarian cyst. In intraligamentary growths, especially the papillary cystadenoma, severe menorrhagia occurs from pressure upon the uterine veins.

Complications. Ascites occurs infrequently with cystic growths, unless from rupture, but frequently in the solid tumors. The cause is unknown. It may arise from pressure upon the venæ cavæ and large abdominal veins. Edema may involve one or both legs. Distention occurs in the pelvis of the kidney and in the ureter from pressure along the course of the latter. The most frequent complication is the formation of adhesions between the surface of the tumor and the omentum, the intestines, the uterus, the bladder, and the abdominal wall. These adhesions arise from inflammation, peritonitis, and sometimes painlessly. They possibly arise from the loss of surface epithelium of the cyst, through friction; fibrinous exudation results, and the formation of adhesions between adjacent surfaces. The adhesions become firm, dense, often thread-like, and between the omentum and the growth may convey vessels of sufficient size to be an important factor in the blood-supply. Dermoids frequently are complicated by adhesions. When adhesions occur between the tumor and the bladder or the intestine, the cyst may open into either, and thus discharge its contents. A tuft of hair may project from a dermoid into the rectum or the bladder. Adhesions are of importance from the increased difficulty in the removal of the growth. It is frequently exceedingly difficult to distinguish the cyst-wall from the parietal peritoneum.

Torsion of the Pedicle. A moderate twisting of the pedicle to 90 degrees produces no symptoms; it is only when the torsion is sufficient to influence the circulation, or above 180 degrees, that disturbance is occasioned. A slight twisting always occurs with the elevation of the cyst from the pelvis. The right-sided tumor turns to the left, and the left-sided to the right. The cause of the torsion is unknown. Küstner ascribed it to peristalsis and the changes from the distention of the rectum; Cario, to sudden belly pressure; Mickwitz, to contraction of the transversalis muscle. The influence of pregnancy and changes of position in a relaxed abdomen which contains a tumor with a long pedicle are factors. This torsion may readily arise from manipulation to determine the diagnosis. I saw it occur in a young girl who had been thrown upon the floor by her companion, who sat upon her abdomen. The torsion may occur with very small tumors which are still within the pelvis, in which it most probably arises from the varying distention of the bladder and rectum. The twist may involve but one or two turns of the pedicle, though as many as six twists have been observed. The tube usually shares in the twisting, and torsion of the uterus infrequently has occurred. Torsion of the pedicle may take place in any variety of tumor, though from its greater frequency it is found most often in the cystadenoma. Dermoids and parovarian growths also show a marked tendency to undergo pedicle-torsion. The tendency to torsion of the pedicle is favored by the existence of a long, membranous pedicle, a spheric form of the tumor, and a smooth surface. The twisting is still further favored by pregnancy, labor, and child-bed, through the changing relations of the organs in the abdominal cavity.

The results of the torsion are dependent upon the rapidity with which it has occurred. The torsion causes obstruction of the vessels, in which the thin-walled veins suffer before the more resistant arteries. There necessarily results an increased engorgement of the blood in the tumor. Solid tumors are completely penetrated by blood, and cystic growths undergo hemorrhagic infiltration of the walls as well as of the contents. The surface presents a black, blue, or dirty brown color, the cyst rapidly increases in volume, and as a result breaks down easily. A fatal result may occur from hemorrhage into the abdominal cavity. More frequently hemorrhage is arrested, but the nutrition of the tumor suffers. The covering epithelium is lost, and extensive adhesions occur between the surface of the tumor and the surrounding structures, as the omentum, intestines, and parietal peritoneum.

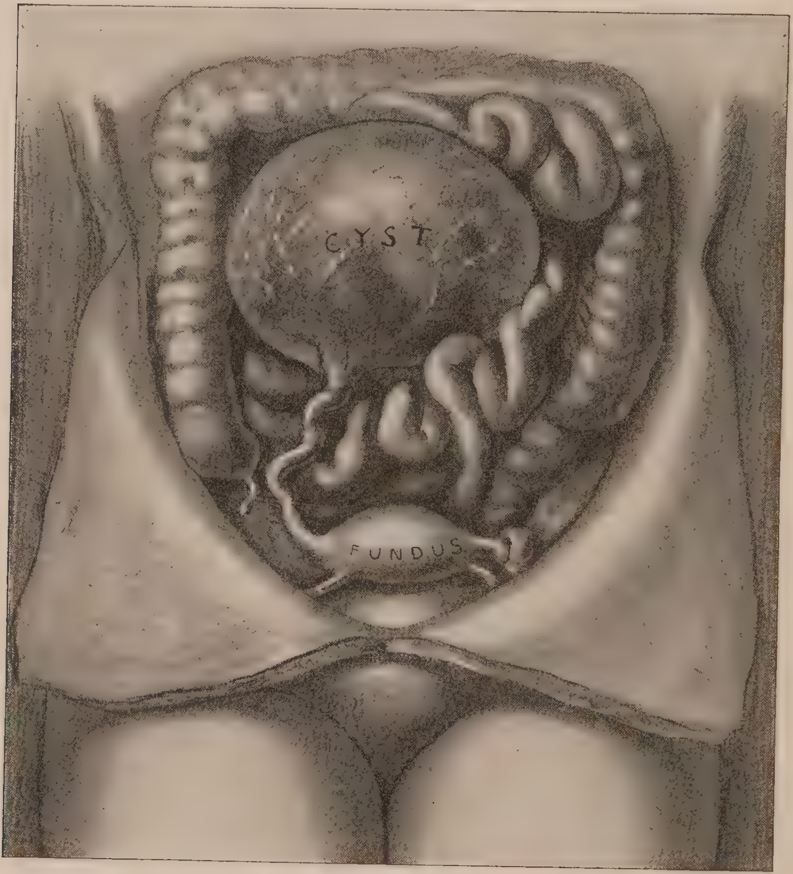


FIG. 575.—Torsion of the Pedicle.

These adhesions are, at first very loose, then become organized, and the growth thereby obtains a new source of nutrition, by which it maintains its size or proceeds to new growth. Further twisting leads to obstruction of the arteries, which is followed by necrosis of the growth. Necrosis is followed by shrinking of the tumor from the absorption of its fatty constituents, though it rarely disappears. It may become calcified. Peritonitis, with the formation of extensive ascites, almost always results. The peritonitis arises independent of micro-organisms, and is due to the irritation from the presence of a foreign body or to the chemic products of the tumor. An infection may occur through the tube or from kinking of the intestine. Sometimes suppuration of the tumor and pyemia ensue. A slight torsion may bring edema instead of hemorrhage, and ascites instead of peritonitis. The pedicle may be found attenuated, or its thickness may be doubled. The dermoid growths are sometimes found free in the abdominal cavity or in pedicle-like adhesion with other structures. A dermoid under my observation was held in front of the uterus by adhesions above to the omentum, and below to the peritoneum; the tube and upper part of the broad ligament upon the left side had entirely disappeared. The separation evidently was old, for the wall of the growth had undergone calcareous degeneration. Ileus has resulted from the adhesion of a loop of intestine to the tumor or to its pedicle.

Symptoms. Frequently there are no symptoms of torsion. Such cases are usually recent or the torsion has been slight. It may be suspected when the patient is taken with severe pain in the belly, associated with meteorism, and sensibility to pressure, acceleration of the pulse, sometimes also singultus, vomiting, and fever. In torsion of high degree indications of intra-abdominal bleeding appear frequently with marked collapse. In the chronic condition the pain and unfavorable symptoms are more gradual, though many patients are bedridden and show a distinct loss of strength, occasioned by the absorption of the altered constituents of the tumors producing a condition resembling cachexia.

Inflammation and Suppuration of the Cyst. Cysts may undergo inflammatory and suppurative changes, though much less frequently than formerly, as puncture of the cyst is not so often practised. In some tumors the contents of which resemble pus, the microscope demonstrates that the material consists of epithelium and cell detritus, but not of leukocytes. The inflammation is communicated mostly by the tube and intestine; the latter especially when adhesions have taken place between the intestine and the sac. Opportunities for infection are increased by parturition and the puerperium, as a result of the possible trauma occasioned during labor. Dermoid tumors are inclined to suppuration, formerly supposed to be due to the peculiar pus-exciting character of their contents, but more probably the result of injury which the tumor has undergone during its long retention within the body. We have already seen that the dermoid was prone to torsion of its pedicle, and its contents are an excellent culture-medium for the propagation of bacteria.

Symptoms. The occurrence of inflammation and suppuration is characterized by fever and typhoid phenomena, which vary in intensity according to the nature of the infection. The patient does not experience much pain unless peritonitis is associated. The pulse becomes rapid and emaciation is progressive. Adhesions to the suppurating tumor occur, and the pus makes its exit, as in ovarian abscess, into the bladder, the rectum, or the vagina. It is but rarely that the pus is completely evacuated and spontaneous recovery results. Death usually follows from pyemia. A rupture into the peritoneal cavity is followed quickly by fatal peritonitis. The evacuation of such a tumor through the bladder produces the greatest distress, as hair, teeth, and pieces of bone are discharged, sloughs become impacted in the urethra and induce cystitis, and there are retention of urine and marked vesical tenesmus. Fragments which remain in the bladder are coated over with urine salts, and become the nuclei of calculi.

Rupture of cystic tumors may occur suddenly as the result of a fall or blow, or gradually may result from changes in the cyst-wall. It occasionally follows from internal pressure caused by the growth of the tumor. The latter accident produces no symptoms, and it is only exceptionally that hemorrhage complicates spontaneous rupture. In papillary growths the pressure of the vegetations causes thinning of the cyst wall, and, finally, rupture; or the growths project through the wall of the cyst, to extend over its external surface. Rupture of a cyst may occur into the surrounding viscera, but more frequently takes place into the peritoneal cavity. In very thin-walled cysts this rupture occurs easily. Manipulation to determine the diagnosis, changing the position in bed, the act of coition, or vomiting, may produce it. It frequently occurs without assignable cause. The influence of the accident will naturally depend upon the character of the cyst-contents. Often, in the unilocular cysts, rupture into the peritoneal cavity is attended with no untoward symptoms, beyond an excessive flow of pale urine. The patient will often pass several gallons of urine in twenty-four hours, and the abdomen, which was large, will become flattened, flabby, and readily permit the residual sac to be recognized by palpation. In single and parovarian cysts recovery occasionally may follow the rupture.

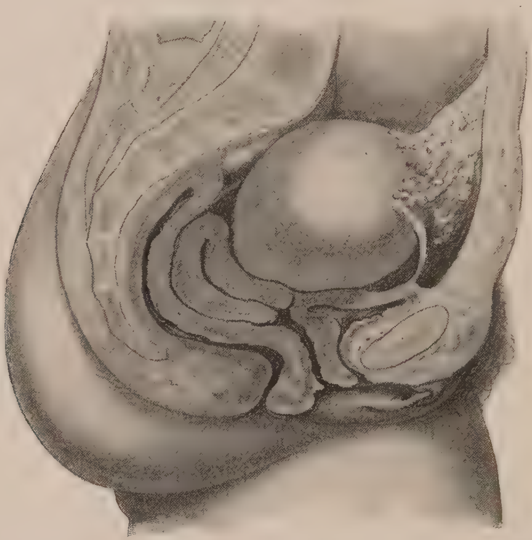


Fig. 576.—Dermoid Which Had Lost Its Original Relations and Was Nourished by Adhesions from the Omentum.

Generally, the opening is closed by adhesions, and the fluid reaccumulates. In some cases the accident is followed by high temperature, rapid pulse, vomiting, pressure at stool, and diarrhea, which indicate the absorption of the contents and the development of a form of auto-intoxication. In multilocular and dermoid growths the rupture into the peritoneal cavity ordinarily is followed by infection, a rapidly developing peritonitis, and, finally, death. Such a termination is probable not only in dermoid, but also in those cysts containing colloid material and pus. In the papillary cysts rupture results in the infection of the peritoneum, the formation of ascites, and the development of vegetations over the entire cavity. Sometimes an artery is torn in the rupture, and marked hemorrhage, with profound anemia, follows. Profound collapse has been noted.

The occurrence of rupture is recognized by the disappearance of, or diminution in the size of, the tumor, the recognition of free fluid in the peritoneal cavity, peritonitis, collapse, diarrhea, and diuresis. The accident may be mistaken for torsion. Rupture into the intestine is evident from the character of the discharges and should be suspected when a profuse watery discharge escapes from the bowel. External rupture usually is recognized easily. When the discharge is pus or ichorous material alone, it is often difficult to determine whether it is from a cyst or an abscess in the walls.

Complication of Ovarian Tumor with Pregnancy. The existence of ovarian growths does not preclude the occurrence of pregnancy, though their coëxistence is comparatively rare. It is more frequent in the one-sided, though it occurs sufficiently often in double-sided, disease to demonstrate its possibility as long as any functionating portion of ovary remains. The complication may occur with any variety of ovarian tumor, though it is more likely to complicate the slow-growing forms—the dermoid and the pseudomucin—than the others. Numerous cases are recorded in which the patient carrying an ovarian tumor has successfully run the gauntlet of several pregnancies. The existence of such a tumor, however, does increase the distressing symptoms and the danger of pregnancy. There is not the same tendency to rapid growth of the cyst during pregnancy as exists when a fibroid growth is complicated by the same condition. The assertion that the occurrence of pregnancy favors malignant degeneration in the cyst is unproved. The occurrence of carcinoma in a cyst during pregnancy is no proof that it was not previously there, nor that it would not have occurred had pregnancy never existed. The changing relations of pregnancy, labor, and the puerperium undoubtedly favor the occurrence of torsion of the pedicle; and the delivery of the fetus, whether naturally or by the use of instruments, frequently crushes or bruises the cyst so that it ruptures or undergoes inflammation and suppuration. While the varying relations of pregnancy, labor, and the puerperium exert an injurious influence upon the progress of the tumor, it can, on the contrary, greatly disturb these processes. The diminished space in the abdomen affords less room for the normal development and increases the danger of abortion and premature delivery. Abortion frequently has been reported as a result of the retroflexion of the uterus produced by the tumor. In labor a large tumor may interfere materially with the normal forces of delivery by decreasing the activity of the contractions and by altering the situation of the uterus. More worthy of consideration is the situation of a tumor of small size in the pelvis, below the uterus, where it acts as an obstruction to the progress of the child's head. If the tumor is not flattened or pulled out of the pelvis, the head of the child cannot enter, and, unless otherwise alleviated, labor may terminate in rupture of the uterus, tearing of the vagina, or bursting of the cyst. Such complications necessarily are attended with danger. The puerperium may be complicated by gangrenous processes in the tumor and its pedicle, following the injury of labor.

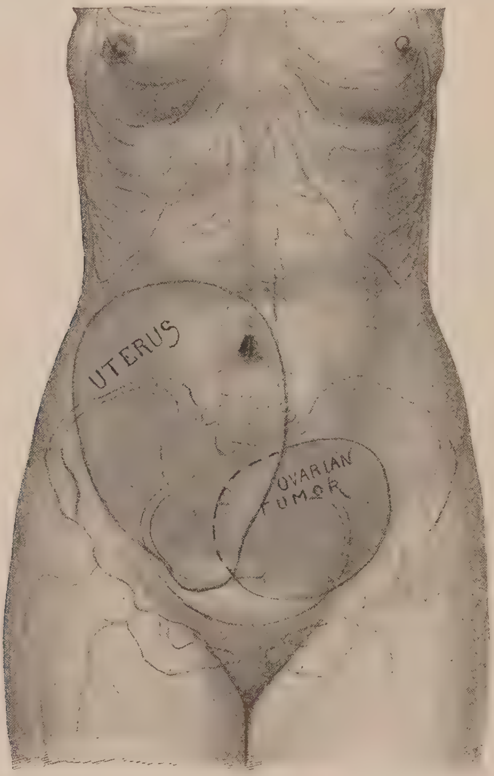


FIG. 577.—An Ovarian Cyst beneath a Pregnant Uterus.

The coëxistence with pregnancy of ovarian tumor, when large, causes increased difficulty in respiration, through pressure upon the diaphragm, and may cause danger to life by the pressure and the tendency to albuminuria and edema. The tendency to torsion of the pedicle, to rupture of the sac, and to subsequent inflammation naturally clouds the prognosis.

When the cyst is situated in advance of the uterus, an effort should be made to push it up, and, upon failure, we may be left to the choice between delivery of the growth through a vaginal incision or its puncture through that canal and its removal after delivery. In the early months of the pregnancy operative interference for the removal of the tumor has little influence upon the progress of the pregnancy, and should be considered whenever the size and situation of the growth threaten the successful termination of the pregnancy.

Degenerative Changes in the Cyst-walls. The cyst-walls may undergo the following degenerative processes:

First, *calcification*, which occurs most frequently in the inner layer of the main cyst-wall in the form of small granules or plates of lime, or the formation of psammous bodies similar to those seen in the papillary cysts. Calcification is increased with the impairment of nutrition following gradual torsion. In a case of dermoid which came under my observation the deposit was so extensive that the tumor resembled a calcareous fibroid.

Second, *fatty degeneration* occurs in the papillary cells and in the connective tissue of walls of the cyst. This process is enhanced by impairment of nutrition. The change in the septa of cysts occurs from the pressure of their contents, and ends in their partial or complete destruction. The presence of a large amount of fat in the walls is an evidence of slow growth.

Third, *atheromatous changes*, which generally occur in the inner layer of the wall.

Fourth, *changes due to infarctions*, which are indicated by whitish, opaque bodies found in the septa and surrounded by a red zone.

Diagnosis. Inspection, palpation, percussion and auscultation in the diagnosis of ovarian tumors are used to determine the physical signs. (The method of procedure and the information derived therefrom has been given.) (§44–48.) The readiness with which the diagnosis will be determined depends upon the size, situation, relation and complications of the tumor.

The questions under consideration are: 1, Is the abdominal enlargement under observation a tumor? 2, The existence of a tumor recognized, is it an ovarian growth? 3, An ovarian tumor admitted, what are its relations to the surrounding parts? Has it a pedicle? Are there adhesions? 4, What variety of ovarian tumor is it?

The first question, *Is the distention of the abdomen an intra-abdominal tumor?* may seem unnecessary, but the frequency with which various enlargements of the abdomen are mistaken for growths, and the occasional difficulty in arriving at a certain determination fully justify its careful consideration. For convenience of study we divide the ovarian growths into small, or those situated within the pelvis, and large, when they are resting upon the pelvic brim.

The extra-abdominal enlargements, other than tumors, with which an ovarian tumor may be confused are obesity, desmoid tumor of the abdominal walls, ventral hernia, tympanites, fecal accumulation, distended bladder, ascites, and localized peritoneal effusion.

Obesity. A large, pendulous abdomen, from the accumulation of fat within its walls or in the omentum, is sometimes mistaken for an ovarian tumor. The history of its development and the distribution of adipose tissue to other parts of the body, contrasted with the general emaciation of an ovarian cyst, should assist in determining the diagnosis. The thickness of the fat accumulation can be estimated pretty accurately by grasping a fold of the skin and subcutaneous tissue between the thumb and fingers.

Desmoid tumor of the abdominal walls is infrequent, develops in the muscle-wall, and partakes of the nature of a fibroid. Generally, from its weight, it forms a dependent tumor, which sometimes hangs over the knees. In rare instances it grows inward, pushing the peritoneum before it as a part of its covering and fills the abdominal cavity. It generally moves with the abdominal wall, and is superficial and very hard. Its situation in the wall, covered by the skin and superficial fascia, and the determination by vaginal or rectal examination of the absence of any connection with the pelvic viscera, determine its character.

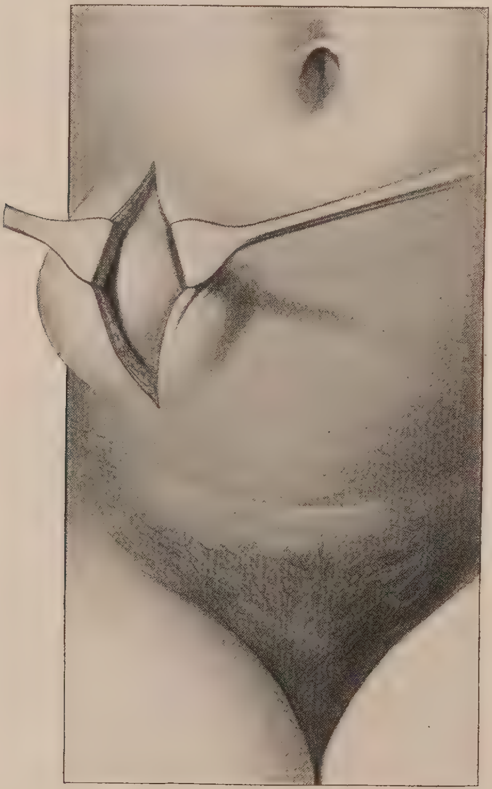


FIG. 578.—Desmoid Tumor of Abdominal Wall.

Ventral Hernia. Twice in diastasis of the recti muscles with a large protrusion of the viscera have I been called a long distance to operate for supposed ovarian cyst. Palpation of the intestinal coils, resonance upon percussion, and observation of the peristalsis, readily seen through the thin covering of skin and peritoneum, should have excluded the diagnosis of a cyst.

Tympanites. A localized tympanites or phantom tumor, a condition similar to pesudocyesis, is sometimes mistaken for an ovarian cyst. The loud volume of resonance obtained by percussion should be considered as contra-indicating the probability of the existence of a cyst. It is true that in rare instances a communication of a cyst with the bowel will permit it to become resonant. A similar condition will arise from decomposition of cyst-contents, by which gas forms in the cavity. Even in these cases a sense of fluctuation may be secured, which is absent in the phantom tumor. The latter will entirely disappear while the patient is under an anesthetic, to return as soon as the patient recovers.

An accumulation of feces is sometimes called a fecal tumor. It forms in the colon, and when in the transverse portion of the gut, may descend and lie directly over the pelvis. These accumulations are occasionally quite extensive, but are recognizable by their length, by the peculiar sensation under palpation, and by the possibility of leaving an imprint upon pressure, but most of all by the fact that they disappear under the administration of purgatives and enemas.

A distended bladder forms a tumor in the lower part of the abdomen which fluctuates and very readily may be mistaken for an ovarian cyst. This suspicion apparently is confirmed by the information that the patient is constantly passing urine. The fixed position, and the bulging of the anterior wall of the vagina, should be sufficient to indicate the use of a catheter, when the tumor will disappear. It should be the invariable rule to empty the bowel and bladder preliminary to the examination of an abdominal tumor.

In pregnancy, fibroid tumor, or even a simple ovarian tumor impacted in the pelvis the urethra may be so distorted and compressed as to render necessary the use of a soft male catheter.

Ascites. In uncomplicated ovarian cysts the differential diagnosis from ascites is not difficult to make. The cysts have, in common with ascites, enlargement of the abdomen, fluctuation, and the symptoms arising from pressure against the diaphragm. Frequently both conditions will be characterized by progressive loss of strength and flesh and by more or less edema of other parts of the body, but there is a marked difference in the manifestation of these symptoms when we come to analyze them. The enlarged abdomen in ascites is more or less flattened and its widest diameter is transverse, while the ovarian cyst is most prominent in the vertical diameter and is narrow from side to side. Fluctuation is very distinct over the abdomen in ascites and in unilocular cysts, but the wave of fluctuation will be found to extend nearer to the vertebræ in the former. In the well-filled cyst the projection of the vertebræ prevents the approach of the fluid to the lumbar regions. In multilocular cysts the wave of fluctuation is more broken, and frequently is recognized only as a sensation of elasticity. The loss of strength is often more marked in ascites, while the appearance of emaciation is greater in the cyst. In renal and cardiac dropsy there is much greater disposition to anasarca. In a very advanced and large ovarian tumor the pressure may induce considerable dropsy of the extremities, but the abdominal distention is in much greater proportion.

On palpation the ovarian tumor presents greater resistance and frequently can be outlined and its surfaces distinctly determined. The abdominal surface can be moved over the tumor and the upper margin is recognized easily. The existence of adhesions or the presence of a large quantity of fluid may obscure the conditions. Percussion affords the most valuable information. In ascites there is a distinct zone of resonance over the center of the abdomen, or the point of greatest prominence,

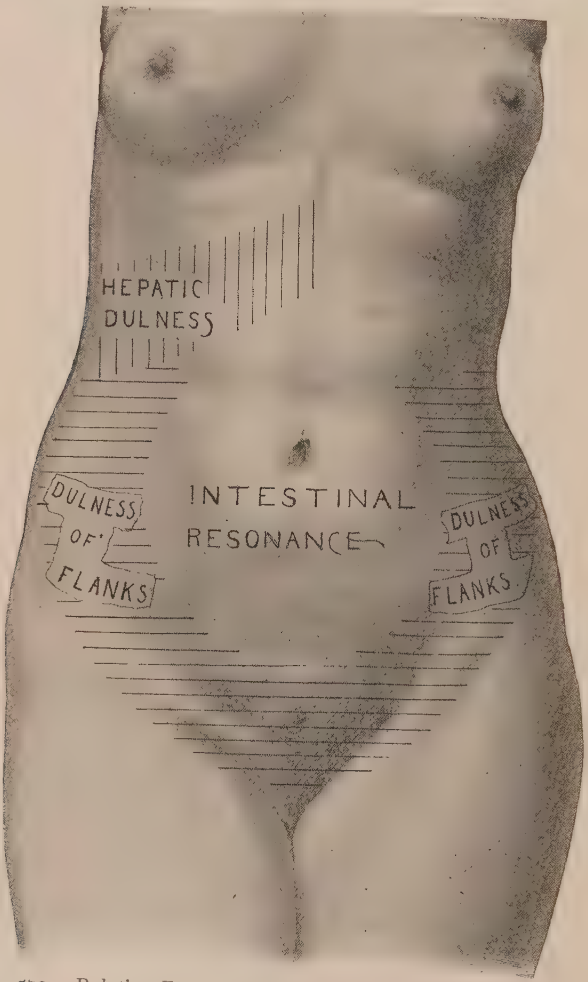


FIG. 579.—Relative Zones of Dullness and Resonance in Ascites.

while the more dependent portions are dull. The zone of resonance changes with the position of the patient. In ovarian cyst, on the contrary, there is dullness upon percussion over the whole surface of the tumor, and resonance only after we have passed beyond its limits, which is unchanged by position. As the tumor, in its growth, presses the intestines upward and to the opposite side before it, the resonance generally will be discovered above, and on the side opposite to that upon which the tumor has originated. Occasionally, in a distended colon, resonance may be secured over it in ascites. When the abdomen is greatly distended, or when inflammatory conditions bind down the intestines, resonance will be absent upon superficial percussion, but may be determined easily when more pressure is used. The pressure displaces the intervening layer of

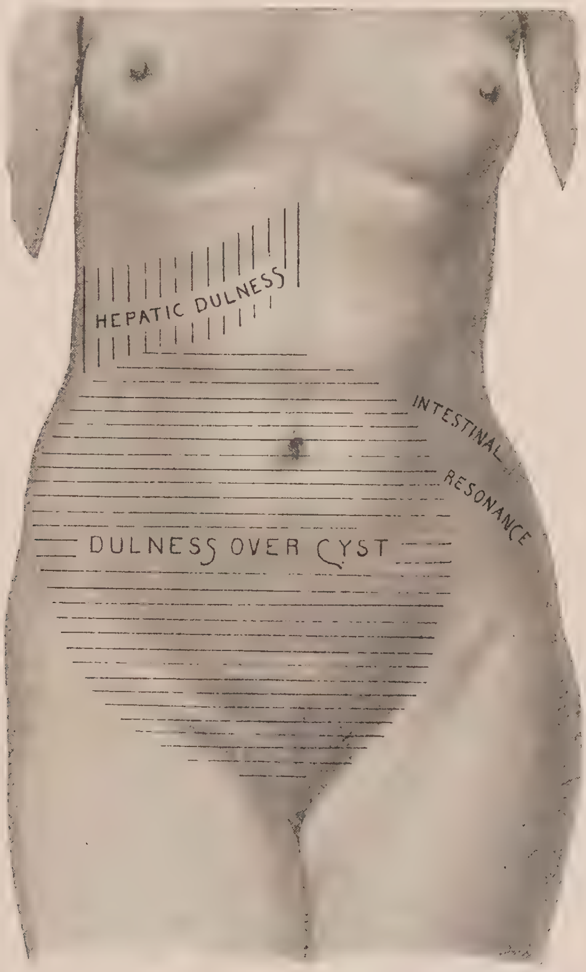


Fig. 580.—Relative Zones of Dullness and Resonance in Ovarian Cyst.

fluid and permits resonance to be obtained. In tubercular peritonitis and in hepatic dropsy, when the mesentery has undergone contraction and the peritoneum is very much thickened, the diagnosis can be so obscure as to require an abdominal incision to determine it.

Ascites may complicate an ovarian cyst, when, by displacement of a layer of fluid, the hand will come in contact with the cyst. The amount of resistance will afford information as to whether the tumor is solid or cystic. The complication of ascites may be regarded as an evidence of malignancy or of some degenerative process. The greater the amount of ascites, the more probable the malignancy. I have, however, seen very large ascitic accumulations from necrosis of a cyst after torsion of its pedicle. The uterus is freely movable, in ascites, while in ovarian cyst it is but slightly movable, and displaced either downward and backward or upward and forward. In ascites arising from ruptured papillary cyst a dense, thickened mass is recognized upon each side of the uterus, which should cause a suspicion as to the character and origin of the disorder.

Localized peritoneal effusion within the abdominal cavity offer great difficulties in determining the diagnosis. Such accumulations are generally the result of tubercular disease, and the history of the development of the disorder, the general condition of the patient, and careful investigation of the abdomen will afford an intimation as to its character. I mistook a collection within the lesser peritoneal cavity for an ovarian cyst. The abdomen presented the characteristic appearance of a large ovarian cyst. A vaginal examination would have revealed the uterus and ovaries below a collection which did not dip into the pelvis, but, unfortunately, no such investigation was made. The diagnosis of ovarian growth was accepted upon the external appearance. Upon abdominal incision the general peritoneal cavity was free from fluid. An apparent cyst upon which the intestines were spread projected into the incision, from which over three gallons of straw-colored fluid were withdrawn, and investigation demonstrated the character of the cavity.

Second, Is the tumor under observation an ovarian tumor? The physical signs vary with the size and situation of the tumor. In the early stage the tumor is entirely within the pelvis, and its position varies. When it reaches the size of a hen's egg, the tumor falls into the pelvis, where it remains until it becomes too large to be accommodated longer in that situation. Its relation to the corresponding side of the uterus permits its character to be determined by conjoined manipulation. When the growth has been complicated by peritonitis, the diagnosis may be difficult. Small tumors usually feel firm because they are not sufficiently large to afford fluctuation, or even elasticity. The latter is of importance, and is generally absent in proliferating cystomata, in dermoids, and even in small single cysts. When we are unable to separate the tumor from the uterus, and consequently to determine the existence of a pedicle, the latter can be ascertained by Hegar's method. This, while the patient lies upon her back, consists in seizing the uterus with a vulsellum and dragging it well down, while two fingers in the recum follow its borders to determine its relation to the growth, or the hand over the abdomen can depress the fundus and thus recognize its relation. When a tumor is not large, it usually can be outlined by a hand over the abdomen and a finger in the rectum. The greatest difficulty is experienced when the tumor is complicated by inflammatory conditions, is fixed, and often incarcerated. Tumors which have originated in the broad ligament, and lie in close relation to the uterus, are usually less spheric and circumscribed, and less movable from their first inception. Fibroid tumors of the uterus and inflammatory enlargements of the tubes are likely to be confused with small ovarian cysts. These are pyosalpinx, hydrosalpinx, and hematosalpinx. The acute history, marked tenderness, evidence of inflammatory exudation, thickening, and matting together of the pelvic tissues, associated with marked pain, should distinguish the pyosalpinx. In hydrosalpinx the tumor may be movable, and may give a sensation of elasticity or fluctuation, but is oblong or gourd-like, rather than spheric. It is frequently closely adherent to the uterus, and affords a history of previous inflammation. A hematosalpinx is at first soft, then becomes hard from the coagulation of the blood. They are usually situated to one side of the pelvis and posterior to the uterus. Fibroid growths are firmer and are closely attached to the uterus.

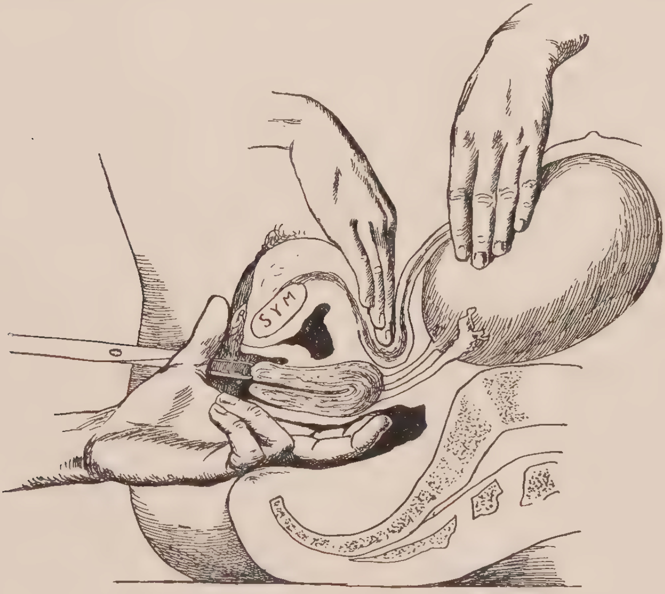


FIG. 581.—Hegar's Method of Determining Relation of Tumor to the Uterus.

Large or Abdominal Growths. A large ovarian cyst distends the abdomen, particularly at its lower part, rises abruptly from the pubes, is sharply defined and generally symmetrically developed. Its outline, extent, and size are readily determined by palpation. In a large single cyst the surface will be smooth and regular, while in the multilocular cysts projections and irregularities are often found. If it is made up of a large number of small cysts, it will be more resistant, although it will still present a sensation of elasticity. These growths are confounded with pregnancy, hydramnios, extra-uterine gestation, uterine myomata, retroperitoneal growths, and tumors of the various viscera of the abdominal cavity.

Pregnancy. Enlargement of the abdomen is more rapid than in ovarian tumor. It is generally associated with suppression of the menses and the presence of such sympathetic nervous phenomena as nausea, vomiting, disturbed appetite, and, in the more advanced stage, a florid, healthy appearance of the patient. Suppression of the menses is not a constant symptom of pregnancy, for there are some women who continue to menstruate during the entire pregnancy, nor is amenorrhea always absent in ovarian growths. Error is more likely to occur in the unmarried, during the early stage of pregnancy. The physician should refrain from making a diagnosis until he has had an opportunity to make a careful examination, and then should hesitate to express an opinion when there is the least reason for doubt. An examination a few weeks later will dispel the uncertainty. There is an absence of fluctuation in pregnancy; but it is also absent in cysts with thick, viscid contents, or in the areolar and glandular varieties, which are made up of a large number of small cysts. As pregnancy advances, the fetal movements, heart-sounds, and parts of the fetus are recognizable. The heart-sounds are pathognomonic of pregnancy, but are not always heard, owing to the position of the fetus, the large quantity of fluid, or to fetal death. The conjoined manipulation will afford information as to the relation of the enlargement to the uterus. Gestation in one horn of a bicornate uterus can make the diagnosis difficult, but a careful bimanual exploration will demonstrate the association of the enlargement with the uterus, and the small undeveloped cornu in association with the enlargement. Under no circumstances should the size of the uterus be determined with a probe when there is the least suspicion of pregnancy.

Hydramnios is a pathologic form of pregnancy in which there is a more or less large collection of amniotic fluid in the uterine cavity. Cases in which the collection exceeds two quarts have been mistaken for ovarian cysts. In large collections the abdominal cavity becomes greatly distended; its surface is smooth, white, and glistening, and fluctuation is very distinct. The patient suffers all the discomfort characteristic of a large cyst. The history will prove of value in determining the diagnosis. Hydramnios generally occurs suddenly, and makes its appearance about the sixth or seventh month of a pregnancy which has previously run a normal course. Such symptoms could arise only from an ovarian cyst which had undergone some marked change in its nutrition, but this diagnosis would be excluded by the previous indications of pregnancy. The physical examination of such a patient will disclose an enlarged uterus, the cervix of which frequently is obliterated, with the os open, and covered with a dense membrane, through which, by manipulation, we are often able to distinguish parts of the fetus or obtain ballottement.

Rupture of the membrane is followed by the discharge of a large quantity of water and evacuation of the uterine contents. The existence of an ovarian cyst does not preclude the occurrence of pregnancy, and the presence of the latter, by the increased flow of blood to the pelvis, may facilitate the growth of the cyst. The rapidity of the growth may be so great as to require early interference in order to save the life of the patient. Careful examination usually will disclose an enlarged uterus either in front of or behind the cyst.

An ectopic gestation which has attained a size sufficient to permit it to be confused with an ovarian cyst will have presented the symptoms of early pregnancy, possibly indications of rupture of the sac, and internal hemorrhage. Later, the tumor may be found to one side of or behind the uterus, and so closely adherent to it as to render the differentiation from it exceedingly difficult. In advanced stages the fetal movements and the heart-sounds may be heard. Vaginal palpation will disclose the fetal parts covered with a thin wall. After the death of the fetus other changes occur which render the diagnosis still more difficult. The fetus shrinks, becomes macerated, and the decomposition produces an accumulation of gas, which, with the distinct fluctuation, makes the condition doubly obscure. A careful analysis of the subjective symptoms, associated with a thorough examination, will generally permit its recognition.

Uterine Myomata. Generally the slow growth, the resistance of the tumor, the usual presence of multiple growths, their irregular contour, and their demonstrable relation to the uterus, should afford confirmation of the diagnosis. A tumor which has but recently come under the observation of the patient, and has, through degenerative or obstructive processes, taken upon itself rapid growth, may afford considerable difficulty in the determination of its true character. The difficulty becomes greater in edematous fibroids and in fibrocystic tumors. It would seem that the demonstration of the continuation of the mass with the cervix would be sufficient to demonstrate the uterine origin. Double ovarian cysts, particularly when the pedicle is short or absent, may so drag upon the fundus uteri as to make it apparent that the growths are a part of the uterus. The relation of the uterus to the tumor is best determined by grasping the cervix with a vulsellum, which is held by an assistant; a second assistant draws up the tumor through the abdominal walls, while the principal, with one or two fingers in the rectum, and the hand over the abdomen, seeks the pedicle and ascertains its relation to the uterus. This procedure, even in double growths, will permit the fundus to be recognized and the nonuterine character of the growths to become known. In the early history of abdominal work the abdomen frequently was opened for an ovariotomy and a uterine fibroid was discovered. Indeed, the earlier removals of the uterus were cases of mistaken diagnosis. Uterine myomata may complicate the presence of an ovarian cyst, and the consequent distention of the abdomen from the presence of two large tumors may render earlier interference desirable. The ovarian cyst may be situated in front of the myomatous uterus, and the growth may be unsuspected until discovered during the progress of an operation.

Retroperitoneal tumors are very rare. They may originate from the tissue in the pelvis or from that of the subperitoneal portion of the abdomen. The more fixed position of the mass, the recognition of resonance over it, and, particularly, the ability to demonstrate, through rectal palpation, the presence of the rectum in front of the tumor, will assist in the diagnosis.

Other Abnormal Collections and Growths. The uterus can present morbid collections, such as physometra, hydrometra, and hematometra. Physometra is a collection of gases within the uterus, the product of decomposition, and is a rare condition. Hydrometra, a collection of watery fluid within the uterus, mostly occurs in women of advanced years, and is caused by retention of the secretions after obliteration of the canal. Hematometra is a collection of blood in the uterus—as the retention of the menstrual discharges from occlusion of the cervix or vagina—and it mostly occurs near puberty. Inspection and bimanual palpation are sufficient to disclose the cause. The situation of renal and hepatic cysts is sufficient to release them from the suspicion of an ovarian origin.

Third, the relation of the tumor to the surrounding parts, the character of the pedicle, and the presence of adhesions:

Adhesions. The mobility of the tumor is dependent upon the length of the pedicle and upon the absence of adhesions. A tumor which may be pushed up without much dragging upon the uterus, displaced from side to side, and the abdominal walls recognized as sliding over it, is reasonably free from adhesions, and has a long pedicle. A tumor which is situated upon one side of the pelvis, pushes the uterus to the opposite side, is quite immovable, or drags upon the uterus as it is moved, is, without doubt, an intraligamentary cyst. Rapid enlargement, tenderness of the abdomen, and a sensation of crepitus as the abdominal wall is being moved over the tumor indicate recent and extensive adhesions, the result of peritonitis. Limited adhesions with omentum, intestines, and abdominal wall cannot be excluded. In very large cysts it is frequently difficult to diagnose the presence of adhesions. Information often can be secured by observing the respirations. In deep inspiration we can feel and see the upper pole of the tumor pushed down, unless it is fixed. The ability to drag the uterus down will assure its freedom. If the fundus uteri remains high when the bladder is empty, it is adherent. The history is valuable, as adhesions occur in torsion of the pedicle, in inflammatory changes, and from traumatism.

Torsion of the pedicle is recognized by the complication of an ovarian tumor with sudden and severe peritoneal symptoms. These are severe pain in the belly, meteorism, vomiting, elevated temperature, rapid growth of the tumor, and tenseness of its surface, which indicate that the torsion has been followed by intracystic hemorrhage or increased exudation.

When the patient is seen long after the torsion, the tumor is everywhere adherent, and the patient may show distinct evidences of marasmus. Sudden collapse, followed by symptoms of internal hemorrhage and by peritoneal irritation, indicate the occurrence of an internal hemorrhage. In the acute stages of torsion it is often difficult to arrive at a differential diagnosis from rupture of an ovarian cyst, peritonitis, perforation of the stomach or intestine, renal or gall-stone colic, ileus, or rupture of an ectopic gestation. An attentive consideration of the history and progress of the disorder will lead to a direct conclusion. Inflammation of a tumor is determined by the accompanying symptoms. The tumor is very sensitive, and presents a spontaneously localized, sometimes radiating pain. The tumor may suddenly enlarge, or the suppuration may lead to the formation of gas and the development of a tympanitic resonance. Perforation of a suppurative tumor into the bladder or intestine is recognized by tenesmus and irritation of the bladder or by diarrhea and intestinal colic. Perforation is certain if portions of the tumor or its contents are found in the discharges. Rupture of a cyst is determined by the associated phenomena. Sudden oppression, suffocation, nausea, sometimes vomiting, diarrhea, acceleration of the pulse, and moderate elevation of temperature indicate the entrance of fluid into the peritoneal cavity. This is rendered more probable by marked diuresis and a perceptible decrease in the size of the tumor, with the presence of free fluid in the peritoneal cavity. The distinct tumor limits are not found, and there is no alteration of resonance with change of position.

Fourth, the variety of the ovarian tumor. The glandular proliferating cyst is the most frequent form and attains the largest size. These tumors are mostly multilocular, and consequently present a less marked wave of fluctuation upon palpation. Fluctuation is an indication of the cystic character of the tumor, and is very distinct in the unilocular and large-chambered varieties. Instead of fluctuation we often find a kind of elasticity, which can be produced by edematous solid growths, and in large cysts the contents of which are made up of colloid or very thick, viscid material. In some cysts, instead of fluctuation, only a kind of vibration is determined. In fluctuating or tough elastic tumors which are nodular we will probably find a cystadenoma. A large fluctuating tumor is not necessarily a unilocular cyst, because it may contain within it numerous small cysts.

Generally, a small cyst which presents no symptoms is not a cystadenoma, but may be a dermoid, a parovarian, or, more probable than either, a simple retention cyst of the ovary or a simple serous cyst. Dermoid tumors are recognized by their irregular consistency—in some places soft, in others hard. A doughy feel has been ascribed to them, but this is rare, as the fatty material at the body-temperature is fluid, and it is only in the presence of a large amount of hair that the doughy sensation can be elicited. The determination that the tumor had been in existence for ten or more years would justify the suspicion of a probable dermoid. Olshausen says that parovarian growths are mostly determined by their moderate size, slow growth, thin and relaxed walls, the translucent fluid contents, and the very distinct fluctuation. Parovarian tumors, as a rule, are spheric, though from their relaxed condition they may assume other forms, especially when pressed into the pelvis. Large cysts are generally multilocular. The presence of double intraligamentary growths, as well as of ascites with small tumor formation, is a presumption, but not a positive indication, of papillary growths, as the conjunction of such symptoms is found in all tumors. Superficial papillomata feel firm, nodular, and are often diffusely extended in the pelvis. In a rapidly developing ascites, in which renal, cardiac, and hepatic causes can be excluded, the presence of bilateral resistance in the pelvis should awaken a suspicion of ruptured papillary ovarian cyst. A pronounced solid consistency of the growth is common to ovarian fibromata, sarcomata, endotheliomata, carcinomata, and teratomata.

Ascitic conditions may complicate all these tumor formations. Ascites when present increases the difficulty of palpation and renders the diagnosis more uncertain. The fibromata and the fibrosarcomata are more or less nodular, of quite firm consistence, and are more frequently situated upon one side. Sarcomata and endotheliomata are generally softer. The solid carcinomata are mostly bilateral, quite nodular, and offer a sensation of toughness. There are no positive indications that a tumor is benign or malignant, as a cystadenoma may contain masses of cancer material. Ascites is generally regarded as an indication of malignancy, but it occurs in pseudomucin cysts, papillary growths, and with the fibromata. Hard consistency and an irregular surface are also reasons for suspicion, but are not positive indications. Early adhesion of the tumor, which prevents the vaginal wall from being moved over it, is an indication of malignancy, when abscess formation can be excluded.

The age of the patient is of little significance, as the age of the climacteric is inclined to the formation of cancer, and all varieties of ovarian tumor may occur at any period of life. Proper metastases, as distinguished from peritoneal implantation, are of significance, but it is not always easy to demonstrate these metastases, as they do not always cause symptoms, or are not perceptible because of the abundant ascites. In other cases metastases will have been discovered in the vagina, the parametrium, and the rectal and peripheral lymph-glands before operation, fixing the diagnosis of malignancy without question. Pronounced cachexia and marasmus may be produced by certain complications, such as rupture, torsion, and inflammation; also in tumors of enormous size. Rapid growth, especially in children, speaks for malignancy. Olshausen directs attention to the early edema of one leg as a symptom of cancer.

Exploratory Puncture. In obscure and complicated cases it was formerly the rule, before resort to operation, to draw off a portion of the cyst-contents for chemic and microscopic examination. The fluid may have such pronounced physical properties as to reveal the true character of the growth. The thick colloid material from proliferating cysts can be mistaken for nothing else. If the fluid is serous, the possibilities of origin are numerous. It may have been furnished by a parovarian cyst, a serous ovarian tumor, a cystadenoma, ascites, hydronephrosis, and echinococcus sacs. In uncomplicated cases the fluid may possess such chemic properties as will aid in the differentiation, but frequently these properties are lost through complications, such as serous transudation and an admixture of blood. The fluid from a proliferating cyst is thick and colloid, with a specific gravity of from 1015 to 1030, and contains paralbumin and cylindric cells. In the papillary cysts there is an absence of paralbumin, while white blood-corpuscles are revealed by the microscope. The fluid from the Graafian follicles does not differ from that of the parovarian cysts. Ascitic fluid is thin and of a light yellow or greenish color, from which albumin is coagulated upon boiling, but no cylindric epithelium is found, and the specific gravity is from 1008 to 1015. In the cystic fibroma the fluid is of a lemon-yellow color, has a specific gravity of 1020, coagulates rapidly without heat, and contains no cylindric epithelium. The fluid from echinococcus cysts presents hooklets, has a specific gravity of from 1008 to 1010, and does not contain albumin. In hydronephrosis the fluid is thin, with a specific gravity of from 1005 to 1018; its color varies, and it contains urea, leucin, tyrosin, and kreatinin. Puncture of a cyst is always attended with danger, and when performed in doubtful cases, for diagnostic purposes only,—as in the echinococcus cysts, renal tumors, abscesses, and dermoids,—is attended with the most serious consequences: the intestines and bladder frequently have been punctured; fluid may escape into the peritoneal cavity and cause peritonitis; or air may enter the sac and result in inflammation and suppuration; a large vessel in the sac-wall has been injured, and a severe and dangerous hemorrhage has resulted. Neither chemic nor microscopic examination of the cyst-contents affords positive information, and the inferences thus secured do not compensate for the increased danger the patient undergoes.

Exploratory Incision. In cases in which we find it impossible to arrive at a positive diagnosis, as in tubercular peritonitis, in malignant disease of the ovary, tube, or omentum, or in papillary cysts, a button-hole incision, sufficiently large to permit the introduction of the finger, will be a far safer procedure than puncture, will afford an opportunity to determine the condition by touch, and will permit subsequent drainage. It should be done under all antiseptic precautions, and every preparation should be made to complete the operation if the conditions will permit. While this procedure is unattended with great danger, its indiscriminate practice is unjustifiable. It should not be utilized to secure information that may as well be secured by the bimanual examination. When the latter procedure has demonstrated an inoperable malignant condition, for instance, the incision should not be made merely for confirmation of the decision.

Treatment. That an ovarian cyst is not amenable to medicinal treatment is evident when we consider that the fluid is contained within a closed sac, which has its own secreting surface. The administration of remedies, and the application of counterirritants to increase secretion and elimination, must be without avail. Electrolysis has had its advocates, but when we consider the character of these growths, and the danger from infection many of them must present, the folly of such treatment is evident. Surgical treatment should consist in extirpation. Puncture is but a palliative procedure at best, for the removal of the fluid is quickly followed by its re-formation, and it requires more and more frequent withdrawal, which proves a severe drain, through the great loss of albumin. As has been stated, it is associated with danger from the puncture of a large vessel in the tumor wall and the consequent hemorrhage; from the possibility of infection by escape of the contents of a papillary cyst or the rupture of a thin-walled cyst and the escape of its contents into and over the peritoneal cavity; or, lastly, from septic infection. Puncture may be resorted to as a temporary measure in a tumor complicating pregnancy, when the cyst is so situated as to form an obstruction to labor, and then should be performed through the vagina, after the most thorough cleansing of that canal. Puncture of a cyst through the rectum, under any circumstances, is an unjustifiable procedure.

344. **Ovariotomy,** as the operation for extirpation of the tumor is known, is the only operation worthy of consideration as applicable to all cases. Success in its performance will depend very much upon the care with which the diagnosis has been made, the knowledge of the operator as to the condition of the patient, the dexterity with which the operation is performed or the readiness in meeting complications, and the judicious treatment of the patient subsequently.

Indications. Recognition of the danger in any operation upon the peritoneum led the early operators to postpone interference until the patient had begun to experience marked discomfort and was suffering in general health from the pressure of the growth. Acceptance of the principles of antisepsis and asepsis has rendered postponement unnecessary. A more careful study of the progress of the growths has demonstrated that it is unwise to postpone operation after a tumor has attained a growth sufficient to permit of diagnosis, because of the various complications which may develop. A large proportion of ovarian tumors are of a malignant character. Schultze places the proportion of malignancy at 27 per cent. of all ovarian tumors; Ruge, at 15 per cent. These variations are dependent upon their appreciation of the relation of papillary formations to malignancy. Pfannenstiel found, among 400 cases in which were included parovarian tumors, that 19 per cent. were malignant. Reckoning the papillary adenomata, the number equaled 26.15 per cent.—a proportion agreeing with the estimates of Schultze and Leopold. It will be seen from these statements that about every fourth or fifth ovarian tumor may be considered malignant. The diagnosis of malignancy cannot be made with certainty. If it is recognized that safety in these cases lies in the earliest possible extirpation, it will be evident that in one-half of all the cases the early extirpation of the tumor will be indicated. Absolutely benign growths of the ovary are unlimited in their size, and thus cause symptoms which imperil the life of the patient and lengthen the time required for recovery. Delay favors the development of complications which, if they do not threaten life, create conditions that render the later operation more difficult and the prognosis less certain. These circumstances, with the present favorable prognosis of ovariotomy, render it desirable that every ovarian tumor should be subjected to operation as soon as it attains a size sufficient to permit of its diagnosis. It was formerly advised to wait until the tumor had reached a size that would permit it to rest upon the pelvis, but no limit is now known, and the operator prefers to remove the tumor as soon as the patient's permission can be secured. The inability to determine the exact character of the growth, and the possibility of very small papillary tumors infecting the entire abdominal cavity, make early operation advisable.

The severity of the symptoms only come into consideration by promoting the early decision of the patient for operation. The difficulties of the operation should not be a cause for delay, as they will not become less by waiting. The stage of life plays no rôle in the decision unless the growth is complicated by acute tubal disease, which may render temporary delay desirable.

The indication for operation should be considered as urgent when the tumor begins to grow rapidly or when symptoms of threatening complications appear. Compression of the lungs, symptoms of uremia, of ileus, of intraperitoneal or intracystic hemorrhage, or rupture of the cyst must be considered as urgent and vital indications. More frequent complications are torsion of the pedicle and inflammation and suppuration of the cyst. The existence of peritoneal irritation has been considered as a reason for delay in operating, but now we realize that the patient has a much better prognosis through early operation than when it is delayed.

Contra-indications. The reasons for withholding operation may be transitory or permanent; the former, in severe complicating diseases, as intercurrent fevers, bronchial catarrh, especially in the aged, progressive weakness from loss of blood, or obstinate gastro-intestinal catarrh. The menstrual period is sometimes regarded as such a cause, but as it does not increase the danger of infection, it is no bar. The permanent contra-indications are: irrecoverable disease of the heart, lungs, kidneys, or liver, marasmus, especially senile, and such diseases as will in a short time certainly lead to death. While pulmonary tuberculosis, valvular disease of the heart, and nephritis are contra-indications, ovariotomy occasionally lessens the danger from the lesion.

Age is no contra-indication, as a number of successful operations after the age of eighty are reported. The mortality of 100 cases operated upon after the age of seventy was 12 per cent. (Kelly). Ovariotomy is not contra-indicated by age unless the tumor is associated with some disease which will render death certain in a short time.

A number of anatomic contra-indications were formerly recognized, among which were adhesions, intraligamentary growths, or the existence of malignity. Adhesions are no longer considered a reason for delay, and frequently the relation of the tumor to the broad ligament is discovered only during the operation. In the majority of cases the attempt at the operation only terminates with its completion. While the most trifling hope of recovery exists, and no traces of cachexia and metastasis formation are present, the operation should not be considered as contra-indicated.

General Considerations. Unless immediate operation is indicated by torsion of the pedicle, rupture of the cyst, or indications of cystic hemorrhage, two days should be occupied in the preparation of the patient, during which the pulse, temperature, condition of the respiratory organs, and urine can be studied. In complicated cases the procedure may be longer delayed, until the condition of the patient can be corrected. In very large cysts, with marked edema and dyspnea many authors advocate a preliminary puncture, in order that the lungs and kidneys may have a few days to recover their functions before the major operation is performed. Because of its many disadvantages, puncture should be done very infrequently. For the performance of ovariotomy the following assistants are desirable: First, a principal assistant, who stands opposite the operator; second, the anesthetist; third, a nurse or a physician to arrange and serve the ligatures and sutures; fourth, a second nurse, to serve and count the gauze pads; and fifth, a nurse to serve in changing the water for the hands of the operator and his assistant and for collecting and counting the soiled pads. All these persons should be trained to know and to do their duty. Directions as to their preparation for the operation are given. (§129.)

Instruments. A knife, two pairs of scissors, two long dissecting forceps, twelve small and six large clamp forceps, two ligature carriers, a needle-holder, an angiotribe, a trocar, a tube, two pairs of cyst forceps, and two short and four long curved needles, each threaded with a double silk loop for carriers, should be provided. The instruments should be carefully sterilized and placed in sterile trays. The patient should be placed upon a suitable table, with her feet toward a good light. An ordinary kitchen table will serve well. The operator stands at the patient's left and his assistant opposite. To the right of the operator is a table, upon which are placed the tray containing the instruments; a smaller one, for the needles and ligatures; and a basin with sterile water, for the hands of the operator. This should be changed as often as it becomes soiled. Behind the principal assistant stands another table, on which are placed the gauze pads and dressings. The soiled pads are collected and counted when the operation is completed. It is important that the exact number shall be known, and that all be accounted for before the wound is closed. When dry pads are used, it is a good plan for the nurse to have a definite number, say a package of twelve, placed in a basin, and no more opened until these are used. As the pads are withdrawn they should be placed aside in packages of the same number, which makes the enumeration of the sponges easily made and the number wanting easily determined. Want of care may result in the retention of a pad, or even an instrument within the abdominal cavity, to the detriment of the patient and the discredit of the surgeon. There should be on hand in the room hot and cold sterilized water,—at least five gallons of each,—slop-buckets, a normal salt solution for irrigation of the abdominal cavity, and a suitable apparatus for hypodermoclysis

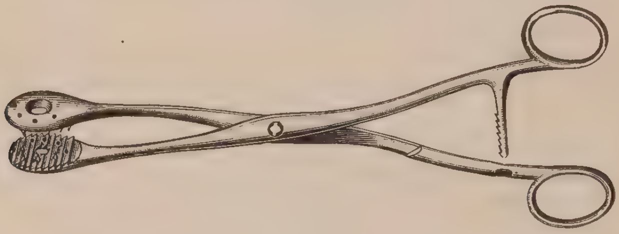


FIG. 582.—Cyst Forceps.

or intravenous injection, should the condition of the patient demand it. In addition, there should be within the reach of the anesthetizer a hypodermic syringe and solutions of strychnin and atropin, gloinin, and antiseptic ergot.

The operation is best described by dividing it into stages and detailing the method of procedure in each. The student can thus secure a graphic outline of the various accidents which may possibly occur and of the expedients to which he will find it best to resort as he proceeds. He will be unlikely to mistake his course on the journey if an accurate chart of each portion is furnished him.

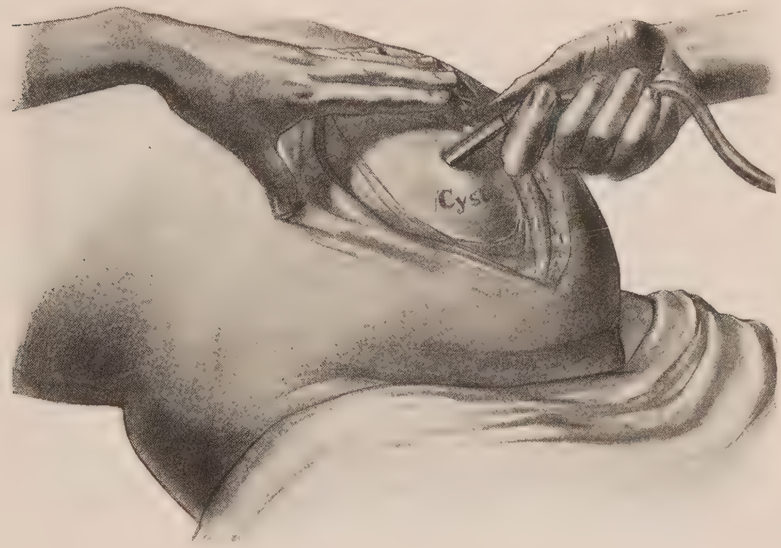


FIG. 583.—Wall Incised; Cyst Exposed.

The different stages are:

1. Incision of the abdominal wall in the median line or through one rectus muscle, securing all bleeding vessels with hemostatic forceps before the peritoneum is opened. (§140.)

2. Puncture and evacuation of the cyst.

3. Removal of the cyst and management of the adhesions. (§145.)

4. The method of controlling the circulation through the pedicle.

5. Examination of the other ovary and of the general peritoneal cavity for bleeding vessels; the removal of all gauze pads. (§146.)

6. Drainage. (§147-148.)

7. Closure of the wound. (§148.)

8. Dressing. (§149.)

1. *Incision of the Abdominal Wall.* Great care was exercised formerly to open the abdominal cavity in the linea alba and not expose the structure of either rectus, but now I prefer to expose the one muscle

and draw it over so that the incision in the posterior fascia is along its inner edge. Less hemorrhage thus results than when the incision passes through the structure of the muscle. The union resulting from the wound made through the linea alba would produce a feeble and resisting ventrum. When there has been previous separation of the recti muscles as a result of the extension, I prefer to expose both recti and so introduce the sutures to hold them and their aponeurotic capsule in accurate apposition. The linea alba is the weakest part of the abdominal wall. The peritoneum is picked up, pulled away with two pairs of forceps from the tumor wall, and an incision is made through it. This avoids injury to the tumor wall or to a knuckle of intestine should it be situated over the cyst. The peritoneum is incised the length of the wound so that it will not be likely to be pushed off during the subsequent manipulation.

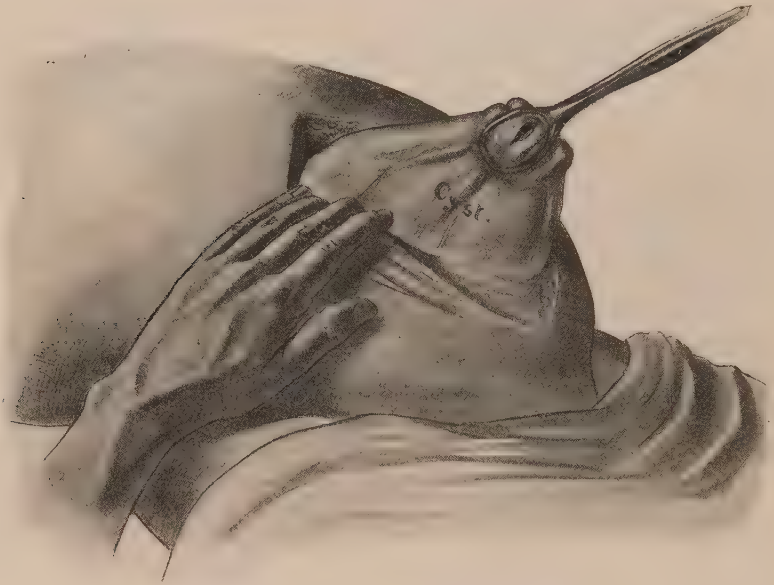


Fig. 584.—Cyst Punctured and Being Withdrawn.

2. *Puncture and Evacuation of the Cyst.* The incision completed and bleeding vessels clamped, the surface of the tumor is explored to determine the presence and extent of adhesions. They should be broken or separated to permit the exit of the superficial portion of the tumor. Various more or less ingenious trocars have been devised for evacuating the contents of the cyst. What is required is a cannula with a tube attached, through which the fluid may be carried to a receptacle beneath the table. The simpler and more readily cleansed this apparatus, the better. A glass nozzle for a fountain syringe, with three feet of rubber tubing, will serve very well. A glass tube of larger caliber will prove more effective when there is a large quantity of fluid to be evacuated, or where the fluid is very viscid. In a specially prepared operating room a cannula, however, is

not a necessary part of one's equipment, for the cyst contents may be readily evacuated through a knife thrust, but at the expense of greater soiling of the room and clothing.

The point chosen for puncture should be situated toward the upper portion of the wound, so that the contraction of the emptying cyst will not draw the opening within the abdomen. The principal assistant should be directed to make pressure upon the abdomen so that the cyst as it empties shall be forced toward the abdominal opening. The edges of the cyst wound can be seized with hemostatic or cyst forceps and drawn out, serving as a funnel as the cyst empties, and before it is completely emptied, unless fixed by adhesions, withdrawn from the abdominal cavity. When the cyst is a large one, I would advise that the patient be turned upon her side, the assistant making firm pressure to keep the cyst pressed into the wound as it empties. This position favors the rapid evacuation of the cyst contents, with the least danger of the entrance of the fluid into the peritoneal cavity. When the operator has provided himself with sterile basins, he can collect the fluid and obviate soiling of the body of the patient, her sterile evironment, and the room with its contents. The lateral position also is favorable in necrotic cysts, as it permits their removal with less soiling of the general peritoneal cavity. The precaution to obviate soiling the peritoneal cavity is especially important when the cyst contents are purulent. The careful observations of Watkins have demonstrated that the contents of these cysts often are especially virulent, producing fatal peritonitis or other form of sepsis whenever the infection has found lodgment within the abdomen. Large vessels in the cyst wall should be avoided in making the puncture, while entrance of the cyst contents into the abdominal cavity can be prevented still further by placing gauze pads

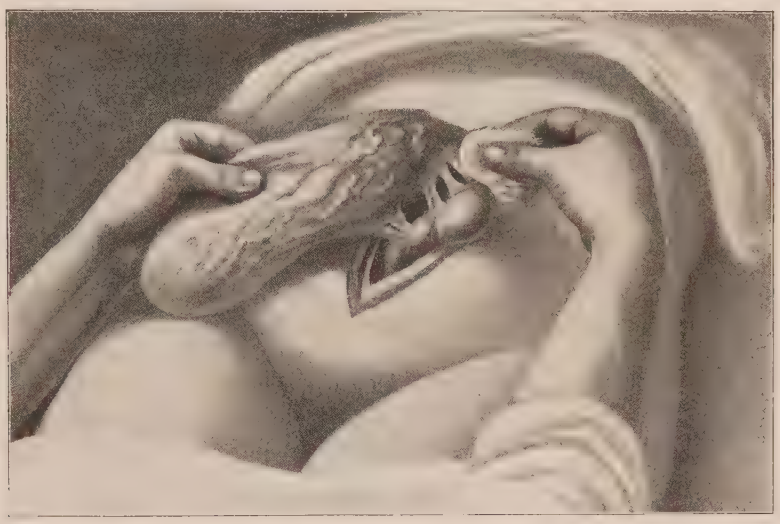


FIG. 585.—Withdrawal of Sac, Showing Adhesions.

between the cyst and the edges of the wound. The operator, by seizing the edges of the cyst wound and forcibly drawing them out emptied, protects the peritoneal cavity from any soiling, especially when the patient occupies the lateral position. When a cannula is used, the relaxed cyst upon either side of the cannula is caught with suitable forceps and drawn out. In nonadherent cysts this procedure will permit the removal of the sac, when empty without any soiling of the abdominal cavity. In multilocular cysts the largest cyst exposed is first evacuated, through which succeeding cysts may be then emptied, drawing the first out to serve as a funnel. Areolar and dermoid cysts are best removed without effort at their reduction, because the contents, especially of the latter, are irritating to the peritoneal cavity and difficult to remove from it. Occasionally, the cyst-contents are so viscid that they refuse to run through the cannula. The edges of the puncture are seized and the sac is drawn forcibly against the wound, while the opening is enlarged and the jelly-like contents are scraped away.

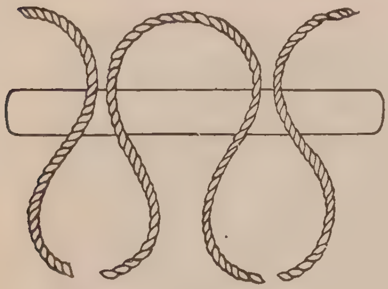


FIG. 586.—Ligatures Introduced through Broad Pedicle.

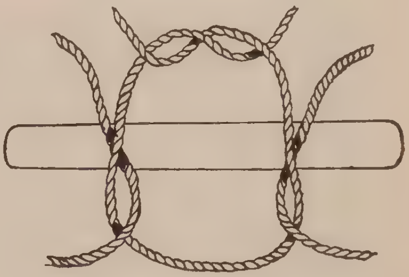


FIG. 587.—Interlacing of Sutures to Prevent Splitting of Pedicle.

3. *Removal of the Cyst and the Management of Adhesions.* In non-adherent cysts the tumor is already delivered, but in the presence of extensive adhesions its delivery may be attended with the greatest difficulty and the gravest peril. The aim, as far as possible, should be to separate old adhesions under the eye. Recent adhesions frequently can be separated by a pad pressed against them as the sac is drawn out, or the hand may be passed into the abdomen over the tumor and thus quickly separate the recent adhesions. In old cases with extensive adhesions the conditions are different and it is unwise to separate adhesions except under sight. This purpose may require a much longer incision to permit of the adhesions being treated under the eye. The adhesions, where possible, should be torn, but where this is not feasible, they may be cut with scissors or knife, making sure that large vessels are secured. Occasionally the adhesions are so short or the contact so close between the cyst and coils of intestine that the separation is impossible. The cyst wall may be cut through, leaving a portion attached, resembling a patch. Care must be exercised, however, to remove all secreting surfaces from the lining membrane of the cyst. Great care must be exercised

in separating old adhesions, as large vessels in the omentum, mesentery, and pelvis may be torn, producing severe or even fatal hemorrhage. Injuries to intestines, bladder, spleen, or liver may occur, which if overlooked, produce fatal results. When the tumor has been delivered its pedicle, if sufficiently long, should be clamped and the mass removed. A hasty glance is then given to the condition of the viscera where dense adhesions have been separated, to make sure that adhesions have not occurred which will cause serious hemorrhage or permit the soiling of the peritoneal cavity with the contents of intestine or bladder.

4. *Management of the Pedicle.* If the pedicle is long and thin, a ligature may be thrown around it and tied. The stump should be folded under in order that it shall not form adhesions with the coil of intestine. In a short, broad pedicle this is not feasible, but the section method, illustrated by Figs. 586, 587, and 588, serves an excellent purpose.

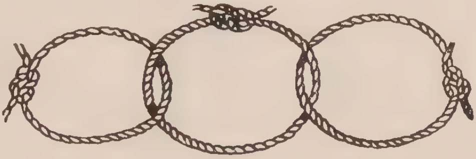


FIG. 588.—Sutures Interlaced and Tied.

When tied in several sections the ligatures should interlace, in order to prevent the pedicle from splitting, and the peritoneum should be sutured over the stump. This procedure takes additional time, but often will save the patient from very uncomfortable if not dangerous adhesions between the stump and intestine. The Downes electric angiotribe affords an excellent method of securing against hemorrhage, and leaves the wound without the irritation of a foreign body. In a cyst without a pedicle the sac should be enucleated and the vessels secured as the operation proceeds. These cases present some of the most trying problems within the realm of abdominal surgery. In cutting away the tumor the precaution must be exercised to provide a sufficient button to prevent the ligature from slipping. If a ligature slips on a short, broad pedicle, the parts spread out, the vessels retract, and serious hemorrhage occurs, which may be difficult to control. Sometimes, when the pedicle has been tied ineffectually, the ovarian or uterine artery slips back and forms a hematoma in the stump, which so fills up the tissues as to make sufficient traction upon the ligature to withdraw the tissue and permit a fatal hemorrhage to follow. The tissue external to the ligature has a tendency to shrink after the removal of the tumor. This should not be forgotten, and when the traction is severe, a second ligature may be placed judiciously behind it to secure the ovarian artery. Silk, wire, and animal ligatures have been employed for securing the pedicle. Silk, from its strength, ease of preparation, and small amount of material required, is employed most frequently. I prefer chromic catgut, but the precaution must be exercised to tie it tight and to leave a secure button, because of its greater propensity to slip. Other methods of securing hemostasis have been employed: the vessels have been twisted; for many years the pedicle was brought out of the wound and clamped; Keith applied a temporary clamp and charred the tissues with the hot iron; Skene improvised a set of electrocautery clamps, by which the tissues were slowly burned through and the application of the ligature avoided. This apparatus has been greatly improved and made practicable through the ingenuity of Dr. A. J. Downes, of this city.

5. The next step was formerly described as *the toilet of the peritoneum.* Unless evidence of hemorrhage makes it incumbent to secure bleeding vessels, the next procedure should be to inspect the other ovary which frequently will be found to be the seat of disease, often completely involved by a glandular, papillary, or dermoid growth. Where necessary, it must be removed, but if possible (unless in mature women), a portion of the organ should be saved. The deprivation of the possibility of procreation is too serious a matter in young women to justify the needless sacrifice of ovarian structure. In many cases, even when associated with large tumors, a portion of the ovary capable of performing all the functions of that organ can be saved. Where adhesions have existed the omentum, mesentery, and pelvis should be inspected carefully for bleeding vessels, and any such should be secured. Wherever possible the peritoneum should be sutured over torn and denuded surfaces, clots of blood removed, and ragged edges left from adhesions cut away. Should oozing occur from a large surface, it may be controlled by infiltration of the tissue with 1 to 4 of a 1:1000 solution of adrenalin chlorid in sterile normal salt solution through a hypodermic syringe. Should this procedure be ineffectual and the surface too large to permit it to be quilted together with a continuous catgut suture, a gauze pack may be employed. The pack has the additional advantage in extensive denudation that it keeps the intestines from contact with the raw surface until the peritoneum has had an opportunity to re-form and thus prevents the redevelopment of firm adhesions. It is true, the packing becomes walled off, but the adhesions thus formed are soon absorbed after the removal of the gauze, unless the patient has become infected. The end of the pack can be brought out at the lower angle of the wound, but the drainage is against gravity, frequent dressing of the wound is required, the danger of infection is increased, and a weakened ventrum results in an increased susceptibility to subsequent hernia. For these reasons it is preferable that the end of the drain be carried into the vagina and the gauze be ultimately removed through that canal. Drainage by the vagina presupposes that the vagina has been sterilized as a preliminary to the operation. Should this have been neglected, the gauze packing may be placed in the pelvis and the wound closed, making an incision through the posterior vaginal vault, which easily can be done for its removal. All wounds penetrating the intestine or bladder should be sutured as soon as discovered in order to prevent the peritoneal cavity from being soiled by their contents. Wounds in the peritoneum, as far as possible, should be sutured. When the omentum has been torn, making a ragged, stringy margin or opening in its structure, it should be ligated and the portions external to the ligature excised.

Otherwise a coil of intestine may slip through such an opening or beneath a band and become strangulated. The peritoneal cavity should be cleansed of blood and cyst contents, preferably by sponging with dry gauze, but when there are large denuded surfaces, or the peritoneum has been soiled with irritating fluids as from a dermoid or suppurating cyst, the cavity should be irrigated with normal salt solution, filled with the solution, and closed. The fluid permits the intestines to float, allows the regeneration of the denuded epithelium, and lessens the danger of unfortunate adhesions. As a final consideration before closing, the surgeon should be certain that the abdominal cavity contains no foreign material, such as gauze pads or instruments. Directions have been given for keeping tab upon the number of pads used and of insuring the certainty of their removal. The surgeon should not rely wholly upon the nurse, but should be certain that he has removed all the pads he has inserted. It is a good plan to wall off the intestines with a long and wide piece of gauze first and place the smaller pieces, when necessary, below it.

6. *Drainage.* This subject is no longer granted the importance in abdominal work it was vouchsafed when I first began the practice of surgery. Then the profession gave heed to the admonition of Tait: "When in doubt, drain." Experience has taught the wonderful power the peritoneum possesses of protecting itself, and, outside of a vaginal wick, drainage is rarely employed. The gauze wick has supplanted the glass drainage-tube. Twenty-five years ago I frequently introduced the glass drain, but have not used one in several years. In extensive denudation of the pelvic peritoneum associated with oozing the gauze tampon is of value. In repair of the large intestine in its lower portion, especially where the tissues sutured are more or less friable from inflammatory changes, it is wise to cover the surface loosely with gauze in order to afford a vent should union fail and a fecal leak occur. The gauze drain, when possible, should open into the vagina and be removed through it. The drain should be permitted to remain from four to six days. The most effective drain for the pelvic peritoneum is the gauze rope brought out through the vagina and the use of the Murphy instillation of salt solution while the patient occupies the Fowler position. (See Peritonitis.)

7. *Closure of the Wound.* The aim of the operator is so to close the wound that like surfaces shall be brought in apposition, and afford as little opportunity as possible for the accumulation of fluids (serum or blood) in the wound. After prolonged observation of different methods I have chosen the procedure described in Section 148 as the most satisfactory and the least likely to be followed by hernia. The one flaw in this procedure is the possibility of serum or blood collecting between the peritoneum and muscle and its infection from its proximity to the intestinal canal. Should the patient after operation have a continuous elevation of temperature for which no explanation is apparent, it will be wise to make a puncture to ascertain the existence of an extraperitoneal collection, when early evacuation saves a weakened ventrum.

8. *Dressing.* The wound dressing should be simple and unirritating. The wound surface should be free from pathogenic germs and protected

from them until recovery has followed. The silkworm-gut sutures are left long, the wound is sponged with 50 per cent. solution of alcohol in sterile water, then covered lightly about the suture ends with gauze, then several layers of gauze, and finally a pad of wood cotton and gauze held in place with pieces of plaster to which tape is attached to be tied over the dressing. The whole dressing is then secured by a Scultetus binder, This method of securing the dressing affords easy access to the wound with little annoyance to the patient.

General Considerations. The study of the differential diagnosis of ovarian tumors should have prepared the operator to appreciate the fact that, after the most careful investigation of his cases, he must frequently expect to meet with conditions entirely different from those which the physical signs have indicated. What appears a simple ovarian cyst may present complications which test the ingenuity of the most experienced operator. The inexperienced operator should prepare himself for every emergency, and should have previously planned for them, as the prudent general plans for the coming battle. The more carefully the case has been studied, the patient prepared, and the emergencies anticipated, the more certain will be the success. It is far better to go through unnecessary preparations many times than to be unprepared once.

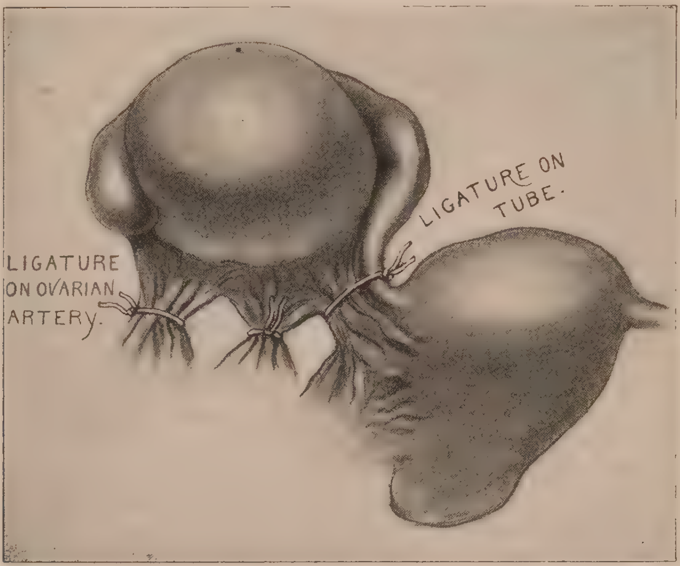


FIG. 589.—Splitting of Pedicle when Sutures are Tied without Interlacing.

Patients with large ovarian cysts frequently suffer from pressure symptoms, and are greatly benefited by previous purgation, stimulation of the secretion of the kidneys and skin, and the administration of strychnin and atropin to strengthen the action of the heart and vessels. In the incision care is exercised to avoid pushing off the peritoneum and to escape injuring the bladder, a loop of intestine, or the cyst. The bladder may be drawn up to a higher level by adhesions to the cyst. It is recognized by the arrangement of the muscle-fibers in its wall. The parietal peritoneum is occasionally inseparable from the surface of the tumor along the line of incision, when the cyst may be opened and emptied before proceeding to the separation of the adhesions.

The intestine is rarely in danger of injury during this stage of the procedure, but occasionally a loop may be situated in front of the cyst.

The toilet of the peritoneum should not be understood to mean thorough drying of the cavity; indeed, much sponging and manipulation of the peritoneum are injurious and favor the formation of adhesions. The cavity is most readily cleansed, with the least injury, by irrigation with normal salt solution. The retention of a considerable quantity of the fluid is beneficial, in that it favors peristalsis, and by its absorption replenishes the liquid waste. Ragged omentum and shreds or bands of adhesions should be removed. When the irrigating fluid continues to come away bloody, careful examination should be instituted to ascertain the source of the bleeding. The abdomen must not be closed while a considerable quantity of blood is being lost. Unless the abdomen has been soiled with infective cyst contents it is better not to irrigate. If the precaution has been exercised to protect the cavity by gauze packing, irrigation seldom will be required. A saline solution is probably the least irritating of any introduced into the peritoneal cavity, but even it handicaps to some degree the functions of this extensive absorbing surface.

Post-operative Treatment. (§150–164.)

Incomplete Operation. The conditions in which the operation has not been completed are most frequently those of intraligamentary parovarian cysts, and particularly papillary cysts. The structure of the broad ligament is more or less involved, and not infrequently adhesions affect a large portion of the intestine. The more experienced the operator, the less frequently will the incomplete operation be performed. With judicious measures, cases in which the operation cannot be completed are exceedingly rare. In the intraligamentary variety an incision of the peritoneum, where it is situated about the base of the tumor, is made, the tumor is drawn up, forming a pedicle, and the tissue is pushed off by blunt dissection. Sometimes the tumor may be opened and an incision made at its base, by which the sac is then dissected out. Frequently it is advisable to precede the operation by ligation of the larger vessels, particularly the ovarian arteries, after which the dissection can be accomplished with less hemorrhage. Adhesions, when in the form of cords and bands, may be cut with the Paquelin cautery. In the papillary variety it is very important that the mass should be removed, even if it is necessary to extirpate the uterus to accomplish it. Frequently what seem desperate cases recover when the original source of the disease is removed, even though extensive infection of the peritoneal cavity has occurred. When adhesions are extensive and the condition of the patient is such as to preclude the possibility of complete removal of the sac, the cavity should be emptied, cleansed, and sutured to the parietal peritoneum of the abdominal wall, while the remaining portion of the wound is closed. The sac cavity is packed with iodoform gauze. Thus it may be kept open, irrigated from time to time with disinfectant solutions, and the packing renewed until the cavity fills by granulation. This procedure necessarily is attended with increased danger to the patient, as it is impossible to keep such a wound completely aseptic.

When a tumor is situated deep in the pelvis, the abdominal opening may be closed after an incision has been made through the base of the tumor into the vagina, through which the end of the gauze packed into the cyst may be carried. Over this gauze the cyst-wall is closed, and covered, when possible, with peritoneal flaps. Intraligamentary tumors are sometimes pushed up into the mesentery, and the removal of the mass necessitates the ligation of important branches of the mesenteric artery. When a large portion of mesentery is thus ligated, the vitality of the portion of intestine supplied by it is endangered and gangrene of the gut may result. Such cases may demand the excision of the affected portion of the intestine and an end-to-end anastomosis. In metastasis of the papillary variety into the omentum, forming, as it frequently does, good-sized masses involving the entire omentum, the latter should be removed after ligation of its base with a number of catgut ligatures. In a patient who had double-sided papillary ovarian cysts, with extensive ascites from the infected peritoneum, and had been subjected three times to abdominal section for the evacuation of this fluid, it was my privilege to remove both ovaries and the greater part of the uterus after an extensive dissection. The entire omentum also was removed. This patient, in whom the dropsical effusion had previously collected so rapidly that they were unable to get her out of bed after operation before the fluid had reaccumulated, had no recurrence of effusion subsequent to the complete operation, and two years later was in good health.

Rupture of the Cyst. In cysts of the glandular variety which have been greatly distended, or where the pedicle is partly twisted, the cyst-wall becomes fragile and is torn easily, permitting its contents to escape into the abdominal cavity. This accident is not a serious one unless the cyst contents have undergone degeneration, as in suppurating cysts, or are irritating in character, as in the dermoid and papillary varieties. Tearing the cyst-wall will necessitate a thorough irrigation of the abdominal cavity to neutralize or to remove the contents. Where the contents of the cysts are quite viscid the peritoneal surfaces become so covered with the material as to make its complete removal impossible. Unless the sac is a malignant one, patients usually recover, and that without drainage.

Hemorrhage. The site of the hemorrhage will greatly influence its character. In large cysts with extensive adhesions hemorrhage may take place from the cyst-wall or from vessels that have been torn within its walls and may threaten a fatal result. The adhesions should be separated rapidly, the cyst raised, and its pedicle secured to cut off the blood-supply. The larger and more vascular adhesions should be separated between ligatures or clamp forceps. If the hemorrhage threatens life, the assistant may place his hand within the abdomen, compress the abdominal aorta, and maintain the pressure until the operation is completed. Such a procedure prevents the further supply of blood, and so arrests the bleeding. Hemorrhage may occur from a very extensive surface, particularly when malignant disease has been the subject of removal, or extensive papillary growths which are intraligamentary or behind the uterus. Fatal syncope and death may follow the removal of very large tumors as a result of decreased abdominal pressure. The vessels relieved from pressure become distended by the blood, and form extensive reservoirs, by which so much of the blood is withdrawn from the circulation as to cause cerebral anemia and the death of the patient. Such a patient can be said to have bled into her own vessels. Such an occurrence is likely to take place only in very large tumors, and may be obviated partly by emptying the cyst slowly. When syncope occurs, the head should be lowered, and an assistant may compress the abdominal aorta with the hand in the abdomen, while the treatment of the pedicle and the toilet of the abdomen proceed. Occasionally, it may be necessary to remove the uterus on account of the free bleeding from its torn and denuded surfaces. The vitality of the patient may be maintained by hypodermatic injections of strychnin, gr. 1/60–1/30 repeated three times at intervals of an hour, a 1 : 1000 solution of adrenalin chlorid, gtt. x—xv every hour, atropin, gr. 1/100, to contract the blood-vessels, ergone, ♏xx, or a hypodermoclysis of normal salt solution. The salt solution can be poured directly into the abdominal cavity while the patient is in the Trendelenburg posture, or transfused directly into a vein. The latter measure affords an increased quantity of fluid by which the vessels can be filled and the heart have something upon which to contract. The fluid should be introduced slowly and 500–1000 cc. given to which has been added 4–8 cc. (1–1000) solution of adrenal chloride.

Visceral Injuries. Injuries to the intestine are possible during complicated operations. In making an abdominal incision the peritoneum should be raised with forceps and a small opening made, to prevent injury not only of the cyst-wall, but of a possible loop of intestine which may be adherent over it. This opening, in the peritoneum may be extended the full length of the external wound by holding it up and incising it under the eye. In dense adhesions the intestines may be torn into, or even across, during the process of their separation. When such a lesion occurs, the intestine should be repaired carefully at once, and measures taken to prevent soiling the peritoneal cavity with the bowel-contents. Openings in the intestine should be sutured carefully, and when the gut is injured so extensively as to render its vitality uncertain, resection and an end-to-end anastomosis should be done. This procedure is accomplished very quickly with the Murphy button or one of the many mechanical devices for holding the ends of the divided gut in apposition. In their absence, the anastomosis may be performed by the Connell suture which consists of a continuous suture beginning within the bowel, tying the knot so that it is in the caliber of the canal. This suture holds the peritoneal surfaces in contact and may be supplemented by an additional suture in the peritoneal surfaces. The continuous suture interlocking may be introduced and superimposed by a similar suture in the peritoneal covering. Such a closure is rapid and very effective. The closure may be made with fine silk or chromic catgut, or the internal may be made with the former and the external (or peritoneal) with the latter.

The most difficult cases for suture are those in which the rectum has been torn low down in the pelvis. Portions of the bowel may be so devitalized that they will not hold subsequently, and a fecal fistula follows. In all cases in which the injury of the bowel has been extensive, and its condition endangered, the parts should be packed with iodoform gauze, which affords a vent in case union is not complete. Complete closure of the wound should be interdicted, because the patient would develop a dangerous peritonitis before the occurrence of rupture is recognized. The position and relation of the ureter should be kept in mind in tumors situated low in the pelvis, or in those which are developed in the broad ligament, and particularly in the papillary forms of ovarian growth, as the ovary may be pulled up or torn off in the enucleation of such masses. When the tumor is so situated as to endanger the ureter, it is better to expose the latter to make sure that it is uninjured. When it has been cut or torn, the preferable procedure is to establish an anastomosis between the divided ends. (Fig. 249.) If this union is impracticable, then transplantation into the bladder should be practised. If the ureter is so short as to endanger its vitality by the necessary traction to reach the bladder the latter should be anchored to the side of the pelvis in a position most favorable to relieve the tension. The ureter may be introduced into the descending colon or an attempt may be made to introduce its end into the ureter of the opposite side; but one should hesitate in attempting the latter, as failure means the imperiling of the unaffected kidney and ureter. Its end may be brought out through the skin and a urinary fistula established, but this means an exceedingly uncomfortable condition for the patient. One alternative is to ligate the ureter, which should be done with double ligature, as a single ligature is likely, under the process of absorption, to become loose and permit a subsequent leakage of urine. The urine is secreted until the pressure from the distended pelvis is equal to that of the blood-pressure, when secretion no longer occurs. The unused organ becomes atrophied.

Another alternative is nephrectomy, but the operator should be well assured that the remaining kidney is healthy before cutting one out of further usefulness either by ligation of the ureter or extirpation of the kidney. If the orifice of the kidney is brought out on the back, a receptacle may be fitted which will add to the patient's comfort.

The bladder may be injured during an operation. It may have been drawn up over the anterior surface of the tumor and raised so high as to be incised or its fundus may be removed before the true character of the injury is suspected. The peculiar interlaced muscular structure of the bladder-wall should permit its recognition. When it is opened or injured, it should be sutured. In a case of fibroid tumor in which it was my misfortune to cut away the entire summit of the bladder the walls were sutured, and the patient recovered. In such cases it is important that the bladder should be watched to prevent its becoming unduly distended during convalescence. It should be evacuated frequently in order to avoid separation of weak union and leakage of urine.

Prognosis. The result of ovariotomy will depend greatly upon the manner in which it has been conducted. With the exercise of every precaution, there will frequently be cases of delayed convalescence, owing to latent or preëxisting pathologic conditions; but the danger is greatly increased when the operation has been carelessly performed and its details imperfectly practised. The operator and his assistants should have been so well trained that no deviation from the proper course, even though slight, will be overlooked. What avails the most rigid cleanliness of person, room, and instruments when a ligature is employed that has been dragged over blankets or unclean tables before its introduction? when the wound is dusted with iodoform from a box that has been standing open, or has been used in all sorts of cases about a ward? when the operator rubs his nose, scratches his head, or touches nonsterilized objects, and introduces the hand into the abdominal cavity without precautionary cleansing? Such indiscretions are often responsible for stitch abscesses and other septic processes. Pus-collections and cellular inflammations in the pelvis in the region of the uterus frequently result from infection of serous collections in Douglas' pouch. Elevation of temperature, rapid pulse, and abdominal tenderness subsequent to the fourth or fifth day should lead to careful exploration for their origin. A mass of exudate in the pelvis should be considered an indication for vaginal incision, for the administration of salines until free purgation is secured, and for the use of rectal and vaginal enemas of hot water at least twice daily. The vaginal incision should be a free one across the vault of the vagina, after which the cavity should be irrigated thoroughly with normal salt solution and an efficient packing of iodoform gauze introduced. Careful sterilization of the vagina should precede the operation.

Intestinal Complications. In difficult operations inflammatory intestinal sequels are frequent. The intestines may be obstructed by twists, and this danger is aggravated by bands of inflammatory adhesions, or by openings in the omentum or mesentery, through which a knuckle of intestine may slip and become strangulated. Lacerations of the intestinal coat affect the peristaltic action, and may lead to paralysis of a section, with ensuing symptoms of obstruction. A twist or volvulus may become so fixed that nothing will pass it. In walls that are already weakened a fecal fistula will result. In a case some years ago in the Philadelphia Hospital an operation by a colleague was followed five weeks later by symptoms of obstruction, and the patient vomited stercoraceous material. The abdomen was reopened and five feet of intestine were torn up, disclosing a distinct volvulus, which was untwisted, when the patient recovered after a prolonged convalescence. The importance of an early reopening of the abdomen in such a case cannot be overestimated, as the obstruction may be due to strangulation of a knuckle of intestine beneath inflammatory bands or to its inclosure between sutures of the wound. The latter is unlikely to occur when the wound is closed in the manner we have suggested.

Causes of death after ovariotomy are, as in hysterectomy, shock, hemorrhage, and peritonitis. These sequels are less frequent, however, as the operation for ovariotomy is more easily accomplished and the duration is shorter than in hysterectomy. Tetanus, which formerly occurred frequently after ovariotomy, is now extremely rare. Ileus may occur in the second week as a result of adhesions or twists of the intestine. Inability to accomplish the evacuation of the intestine by injections with the pelvis elevated, and especially when complicated with stercoraceous vomiting, should require the reopening of the abdomen. The mortality of ovariotomy is very slight—much less than formerly. This is partly due to the fact that operations are now performed early, and it is only in rare instances that the patients are subject to the deleterious action of the cyst. Early operation, before the patient experiences complications, is attended with very slight mortality. Thus, Martin, in more than 1000 ovariotomies, has but 2 per cent. mortality; Olshausen reported his last 100 ovariotomies with only 4 deaths. The uncomplicated ovariotomy has practically no mortality.

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